Name: _____ Class: _____ Date: _____ ID: A

Pre-Calculus 11 Final Exam Review

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ **1.** What is the reference angle for 200° in standard position?

A 100° **C** 20°

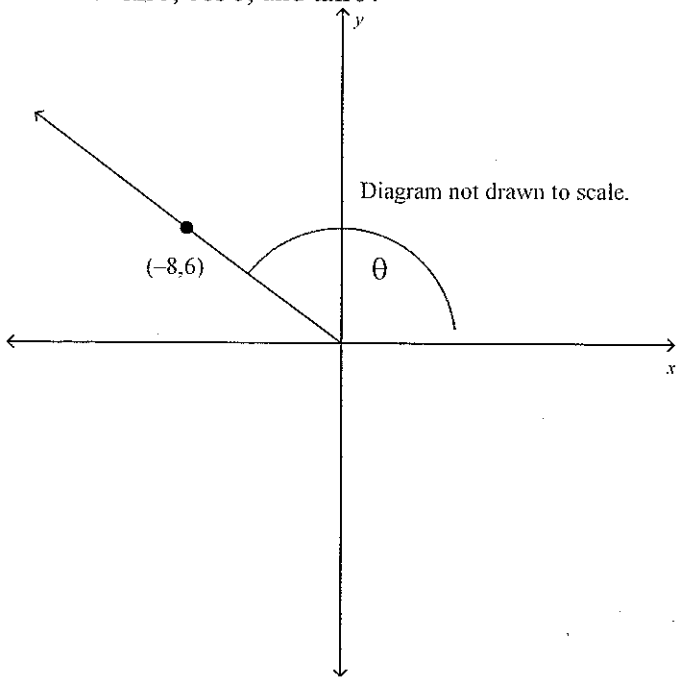
B 70° **D** 110°

____ **2.** What are the three other angles in standard position that have a reference angle of 54°?

A 99°, 144°, 234° **C** 144°, 234°, 324°

B 108°, 162°, 216° **D** 126°, 234°, 306°

____ **3.** The coordinates of a point P on the terminal arm of an angle are shown. What are the exact trigonometric ratios for $\sin\theta$, $\cos\theta$, and $\tan\theta$?



A $\sin A = -\frac{4}{5}$, $\cos A = \frac{3}{5}$, $\tan A = -\frac{4}{3}$

B $\sin A = \frac{5}{3}$, $\cos A = -\frac{5}{4}$, $\tan A = -\frac{3}{4}$

C $\sin A = \frac{3}{5}$, $\cos A = -\frac{4}{5}$, $\tan A = -\frac{3}{4}$

D $\sin A = \frac{4}{5}$, $\cos A = -\frac{3}{5}$, $\tan A = -\frac{3}{4}$

____ **4.** What is the exact value for tan (240°)?

A $\frac{1}{\sqrt{3}}$ **C** 1

B $-\sqrt{3}$ **D** $\sqrt{3}$

____ 5. An angle is in standard position such that $\cos\theta = \frac{1}{9}$. What are the possible values of θ, to the nearest degree, if $0° \le \theta \le 360°$?

A 6° and 174°
B 6° and 276°
C 84° and 264°
D 84° and 276°

____ 6. Determine the length of x, to the nearest tenth of a centimetre.

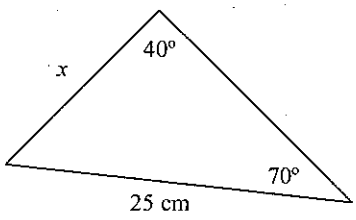


Diagram not drawn to scale.

A 26.6
B 36.5
C 11.2
D 17.1

____ 7. Determine the measure of x, to the nearest tenth of a degree.

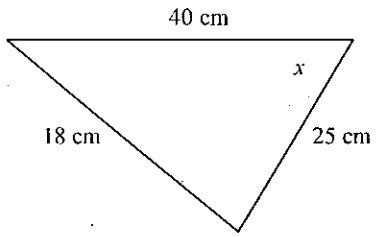


Diagram not drawn to scale.

A 25.6°
B 18.1°
C 136.3°
D 71.9°

____ **8.** What is the length of x, to the nearest tenth of a metre?

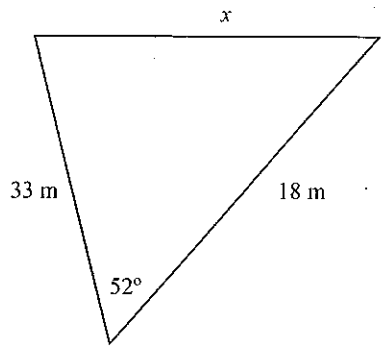


Diagram not drawn to scale.

A 27.7 m
B 21.8 m
C 26.1 m
D 37.6 m

____ **9.** Solve the following triangle, rounding side lengths to the nearest tenth of a unit and angle measures to the nearest degree.

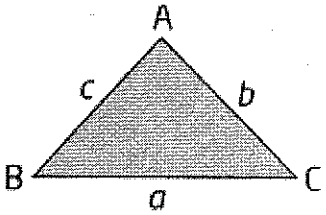


Diagram not drawn to scale.

$\angle A = 152°$, $b = 19$, $a = 23.5$

A $\angle B = 22°$, $\angle C = 6°$, $c = 5.0$
B $\angle B = 158°$, $\angle C = 84°$, $c = 5.0$
C $\angle B = 68°$, $\angle C = 174°$, $c = 28.7$
D $\angle B = 35°$, $\angle C = 7°$, $c = 28.2$

____ **10.** Which function is *not* quadratic?

A $f(x) = (6x+9)\left(\frac{1}{9}x - 9\right)$
B $f(x) = x(x-9)(6x+8)$
C $f(x) = 7x^2 + 8$
D $f(x) = 6(x-9)^2$

____ **11.** What is the function $y = 2(x-4)^2 - 2$ written in standard form?

A $y = 2x^2 - 8x + 30$
B $y = 2x^2 - 8x + 34$
C $y = 2x^2 - 16x + 34$
D $y = 2x^2 - 16x + 30$

____ **12.** What is the equation of the quadratic function $y = x^2 - 26x + 41$ in vertex form?

A $y = -(x + 13)^2 - 210$
B $y = -(x - 13)^2 - 210$
C $y = (x + 13)^2 - 128$
D $y = (x - 13)^2 - 128$

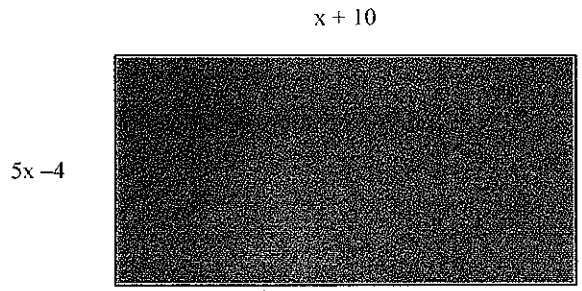
____ **13.** Solve $-8x^2 + 120x + 432 = 0$.

A $x = 18$ and $x = -3$
B $x = -18$ and $x = 3$
C $x = \frac{9}{4}$ and $x = -\frac{3}{8}$
D $x = -144$ and $x = 24$

____ **14.** Determine the roots of the quadratic equation $-5x^2 + 55x = 50$.

A $x = -10$ and $x = -1$
B $x = -50$ and $x = -5$
C $x = 10$ and $x = 1$
D $x = 2$ and $x = \frac{1}{5}$

____ **15.** A rectangle has dimensions $x + 10$ and $5x - 4$, where x is in centimetres. If the area of the rectangle is 72 cm^2, what is the value of x, to the nearest tenth of a centimetre?



A $x = 2.0$
B $x = -4.6$
C $x = 11.2$
D $x = -11.2$

____ **16.** Solve $(x+1)^2 = 43$.

A $1+\sqrt{43}$ and $1-\sqrt{43}$
B $-1+\sqrt{43}$ and $-1-\sqrt{43}$
C $2\sqrt{11}$
D $\sqrt{42}$

____ **17.** The roots, to the nearest hundredth, of $y = -\frac{1}{2}x^2 - 2x + \frac{7}{10}$ are

A –8.65 and 0.65
B 4.32 and –0.32
C –2.16 and 0.16
D –4.32 and 0.32

____ **18.** The line $y = 9x - 4$ intersects the quadratic function $y = x^2 + 7x - 3$ at one point. What are the coordinates of the point of intersection?

A (0,0)
B (1,–5)
C (–1,5)
D (1,5)

____ **19.** Find the coordinates of the point(s) of intersection of the line $y = 4x + 8$ and the quadratic function $y = -4x^2 - 5x + 8$.

A (0, 8) and $(\frac{9}{4}, 17)$
B (0, 0)
C (2, –34)
D $(-\frac{9}{4}, -1)$ and (0, 8)

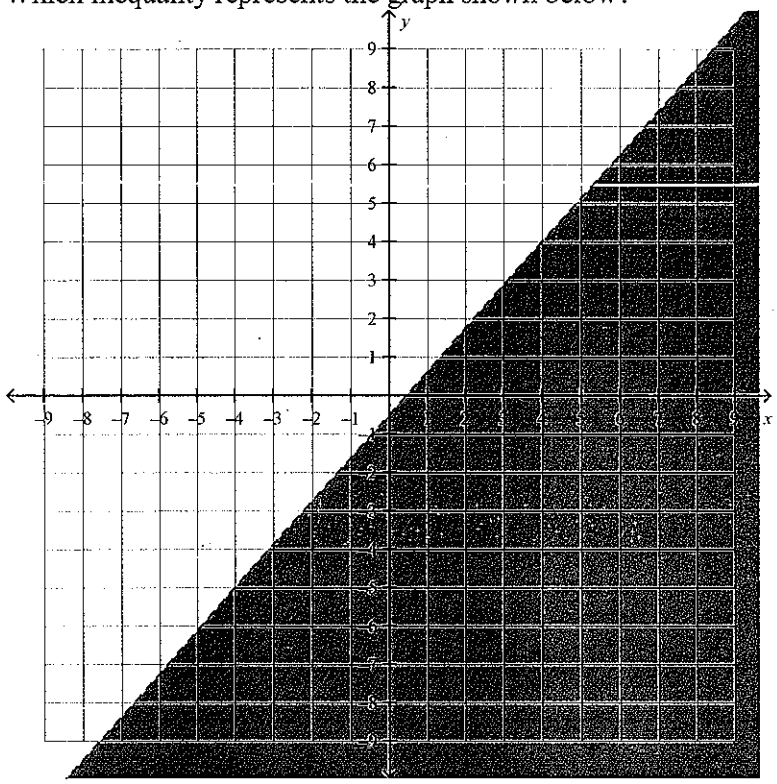
____ **20.** What are the solutions for the following system of equations?
$y = -2x^2 - 9x - 4$
$y = 2x^2 - 5x - 4$

A (–1,3) and (0,–4)
B (1,–3) and (0,–4)
C (1,3) and (0,–4)
D (1,–3) and (0,4)

____ **21.** What are the coordinates of the point(s) of intersection of the quadratic functions $y = -2x^2 - 4x + 5$ and $y = 2x^2 + 4x + 5$?

A (–2,5) and (0,5)
B (2,–5) and (0,–5)
C (2,5) and (0,5)
D (2,–5) and (0,5)

____ **22.** Which inequality represents the graph shown below?



A $y > \frac{8}{9}x - 2$

B $y < \frac{8}{9}x - 2$

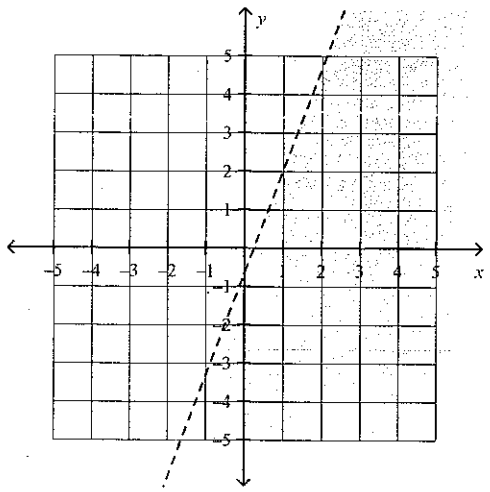
C $y > \frac{9}{8}x - \frac{1}{2}$

D $y < \frac{9}{8}x - \frac{1}{2}$

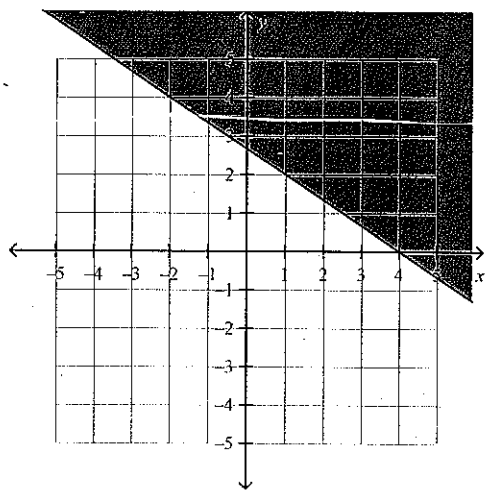
Name: _____ ID: A

____ **23.** The graphical solution to $y < -\frac{2}{3}x + \frac{8}{3}$ is

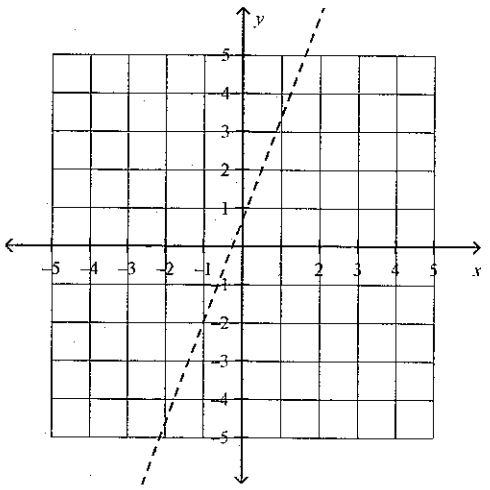
A



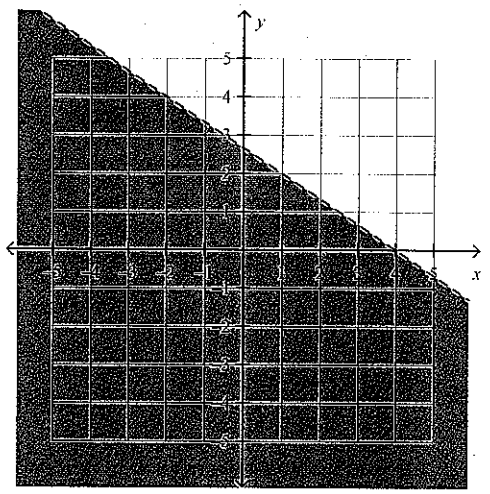
C



B



D



A sports store makes a profit of $50 on every pair of cross-country skis sold and $125 on every set of snowshoes sold. The manager's goal is to have a profit of at least $700 a day from the sales of these two items.

____ **24.** If x represents the number of pairs of cross-country skis sold and y represents the number of pairs of snowshoes sold, what inequality models the combinations of ski and snowshoe sales that will meet or exceed the daily profit goal?

A $50y + 125x \leq 700$

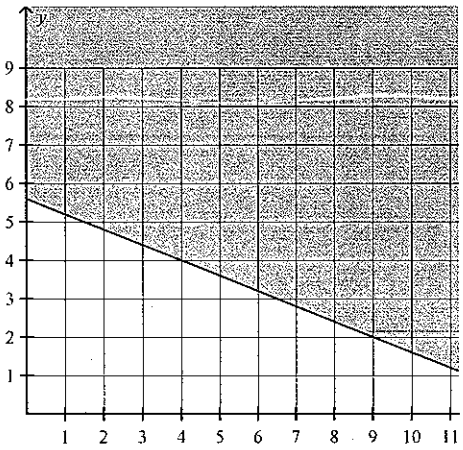
B $50y + 125x > 700$

C $50x + 125y \geq 700$

D $50x - 125y < 700$

____ **25.** Which graph represents the combinations of ski and snowshoe sales that will meet or exceed this daily sales goal?

A



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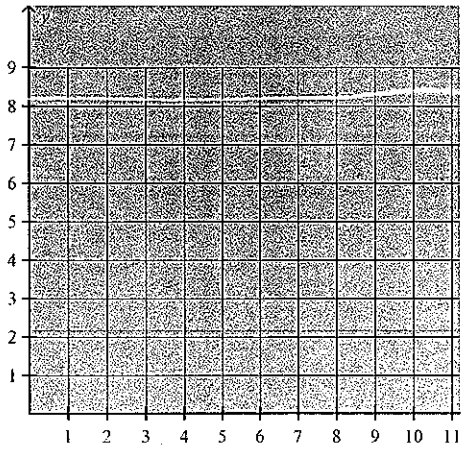

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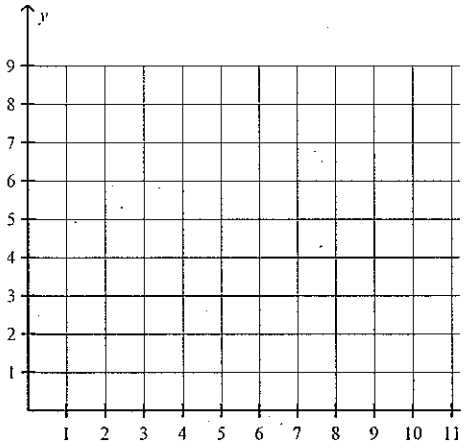
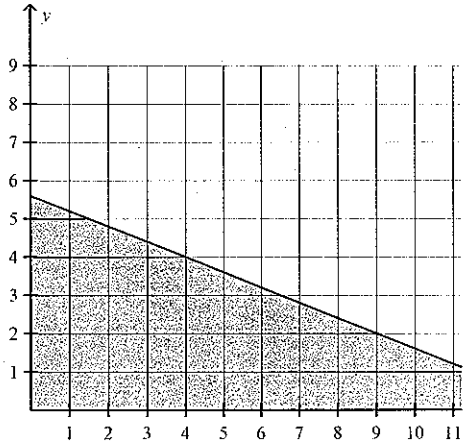
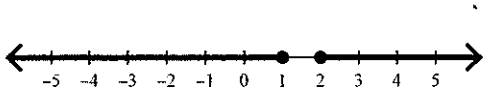


D

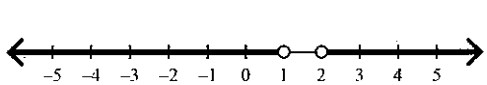


____ **26.** Which graph represents the solution to the inequality $2x^2 - 6x + 4 \geq 0$?

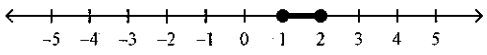
A



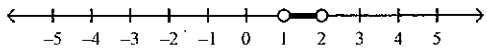
C



B



D



____ **27.** The solution set to the inequality $-2x^2 + 8x - 6 > 0$ is

A $\{x|\ 1 < x < 3, x \in \mathrm{R}\}$

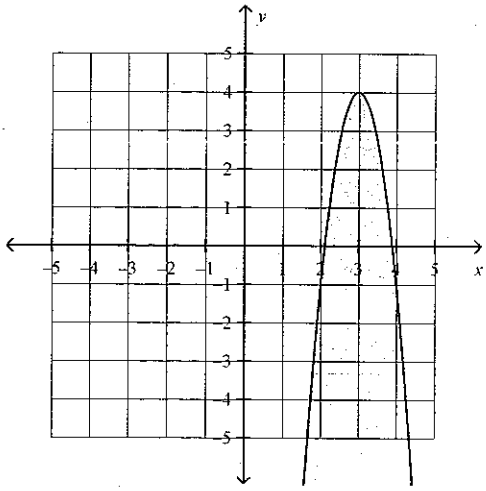
C $\{x|\ x < 1, x > 3, x \in R\}$

B $\{x|\ -3 < x < -1, x \in R\}$

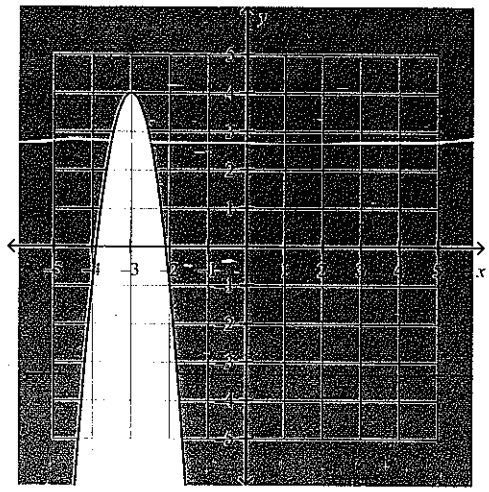
D $\{x|\ x < -3, x > -1, x \in \mathrm{R}\}$

____ **28.** Which graph represents the solution to the inequality $y \leq -5(x+3)^2 + 4$?

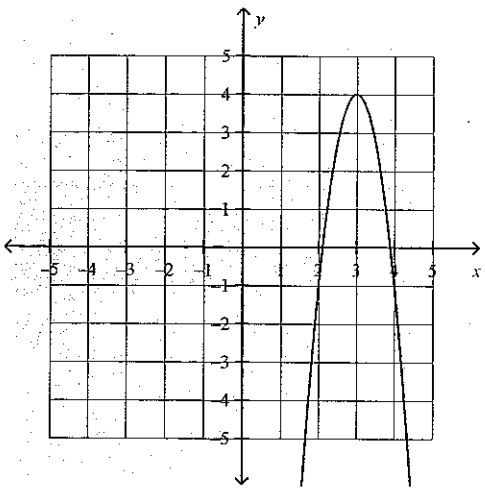
A



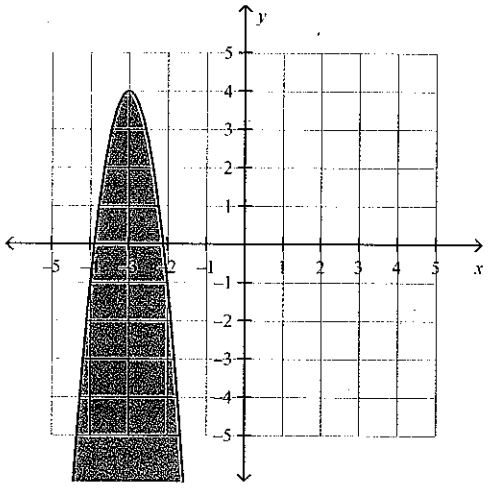
C



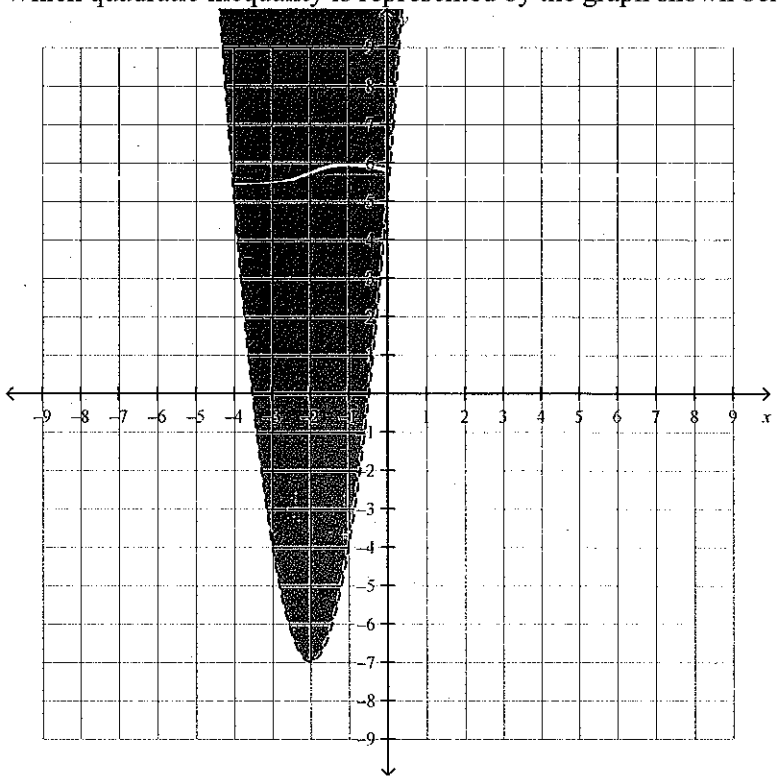
B



D



____ **29.** Which quadratic inequality is represented by the graph shown below?



A $y > -3(x+2)^2 - 7$

B $y > 3(x+2)^2 - 7$

C $y > -3(x-7)^2 - 2$

D $y \leq 3(x-7)^2 - 2$

____ **30.** The common difference in the arithmetic sequence $\frac{1}{2}, \frac{5}{6}, \frac{7}{6}, \frac{3}{2}, \frac{11}{6}, \ldots$ is

A $\frac{5}{12}$

B 3

C 9

D $\frac{1}{3}$

____ **31.** What is the 18th term of the sequence –22, –21.2, –20.4, –19.6, –18.8, …?

A –6.8

B 0.8

C –8.4

D –35.6

____ **32.** The sum of the series (–5) + (–7) + (–9) + ··· + (–19) is

A –96

B –304

C –192

D 26

____ **33.** The sum of an arithmetic series where $t_1 = -2$, $t_3 = 7$, and $n = 15$ is

A –502.5

B 442.5

C 476.25

D 885

____ **34.** The sum of an arithmetic series where $t_1 = \frac{1}{2}$, $d = 3$, and $n = 19$ is

A 551
C $\frac{1045}{2}$
B $\frac{165}{2}$
D 1045

____ **35.** The common ratio for the geometric sequence 8, 1, 0.125, 0.015625, . . . is

A $\frac{1}{8}$
C 8
B –8
D $-\frac{1}{8}$

____ **36.** The population of a community was 82 000 at the beginning of 2000. Assuming a rate of growth of 1.6% per year since 2000, what will the population be at the beginning of 2025?

A 123 894
C 121 943
B 2 082 800
D 120 023

____ **37.** The eighth term in the sequence 3 515 625, 703 125, 140 625, 28 125, ... is

A 9
C 45
B $\frac{1}{9}$
D 5

____ **38.** The first three terms of the sequence given by $t_n = 11\left(\frac{1}{4}\right)^{n-1}$ are

A 11, 121, 1331
C $\frac{11}{4}, \frac{11}{16}, \frac{11}{64}$
B $11, \frac{11}{4}, \frac{11}{16}$
D $11, \frac{11}{3}, \frac{11}{9}$

____ **39.** How many terms are in the sequence 2, 8, 32, 128, 512, ..., 2 097 152?

A 9
C 10
B 12
D 11

____ **40.** The sum of the geometric series $14 + 70 + 350 + \cdots + 43\,750$ is

A 8747
C 54 688
B 10 938
D 54 684

____ **41.** What is the value of S_9 for the series $8 - 24 + 72 - 216 + \cdots$?

A 39 366
C 52 491
B –13 122
D 39 368

____ **42.** Determine the sum of the infinite geometric series $11 + \frac{11}{3} + \frac{11}{9} + \frac{11}{27} + \ldots$

A 33
C $\frac{33}{2}$
B $\frac{33}{4}$
D $\frac{440}{27}$

____ **43.** Determine the sum of the infinite geometric series with $t_1 = 2$ and $r = \frac{1}{5}$.

A $\frac{1}{3}$ **C** $-\frac{1}{2}$

B $\frac{5}{3}$ **D** $\frac{5}{2}$

____ **44.** The sum of an infinite geometric series is $\frac{20}{3}$ and its common ratio is $\frac{1}{4}$. What is the first term of the series?

A $\frac{1}{4}$ **C** $\frac{80}{3}$

B 5 **D** $\frac{5}{3}$

____ **45.** Which of the following best describes the series $-50 + (-45) + (-\frac{81}{2}) + (-\frac{729}{20}) + \cdots$?

A The series is convergent and has a sum of –500.
B The series is divergent and has a sum of –500.
C The series is divergent and has no sum.
D The series is convergent and has no sum.

____ **46.** What does the expression $7\sqrt{7} - 6\sqrt{12} - (4\sqrt{28} + 4\sqrt{3})$ simplify to?

A $15\sqrt{7} - 16\sqrt{3}$ **C** $-\sqrt{7} - 16\sqrt{3}$

B $15\sqrt{7} + 16\sqrt{3}$ **D** $-\sqrt{7} + 16\sqrt{3}$

____ **47.** Express $\sqrt[5]{64n^{10}m^{15}}$ in simplified form.

A $4n^2m^3(\sqrt[5]{4})$ **C** $4n^2m^3(\sqrt[5]{2})$

B $2n^3m^2(\sqrt[2]{5})$ **D** $2n^2m^3(\sqrt[5]{2})$

____ **48.** The volume, V, in cubic units, of a cylinder is given by $V = \pi r^2 h$, where r is the radius and h is the height, both in the same units. Find the exact radius of a cylinder with a height of 64 cm and a volume of 576π cm^3. Express your answer in simplest form.

A $\frac{1}{\sqrt{64}}$ cm **C** 9 cm

B 8 cm **D** 3 cm

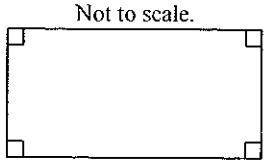
____ **49.** Express $-7\sqrt{6}(-6\sqrt{5} - 2\sqrt{6})$ in simplest form.

A $14\sqrt{6} + 42\sqrt{30}$ **C** $42\sqrt{30} + 84$

B 252 **D** $1260 + 14\sqrt{6}$

____ **50.** Find a simplified expression for the area of this shape.

Not to scale.



A $9\sqrt{7}+16\sqrt{2}$
B $9\sqrt{7}-16\sqrt{2}$
C 95
D 31

____ **51.** Express $\frac{2\sqrt{21}-3\sqrt{7}}{\sqrt{7}}+\frac{4\sqrt{3}-8}{\sqrt{4}}$ in simplest form.

A $6\sqrt{3}-5$
B $6\sqrt{21}-14\sqrt{7}$
C $4\sqrt{3}-7$
D $2\sqrt{21}-3\sqrt{7}+4\sqrt{3}-2$

____ **52.** Solve $\sqrt{4x}-5=6$

A $x=\frac{121}{16}$
B $x=\frac{11}{16}$
C $x=\frac{121}{4}$
D $x=\frac{11}{4}$

____ **53.** Solve $\sqrt{x+3}=\sqrt{2x+8}$.

A $x=25$
B $x=-5$
C $x=\frac{1}{25}$
D $x=-\frac{1}{5}$

____ **54.** What are the restrictions on x if the solution to the equation $-4-\sqrt{4-x}=6$ involves real numbers?

A $x\le 10$
B $x\ge 6$
C $x\le 4$
D $x\ge 100$

____ **55.** The non-permissible value(s) for the rational expressions $\frac{12}{x^2-4}$ is (are)

A $x\ne 2, x\ne -2$
B $x\ne 2\sqrt{3}$
C $x\ne 2$
D $x\ne 4$

____ **56.** What is $\frac{5(4x^2-y^2)}{2x^2-15xy-8y^2}$ in simplest form? State any non-permissible values.

A $\frac{5(2x+y)}{x-8y}, x\ne -\frac{y}{2}, x\ne +8y$
B $\frac{5(2x+y)}{x+8y}, x\ne -\frac{y}{2}, x\ne -8y$
C $\frac{5(2x-y)}{x+8y}, x\ne \frac{y}{2}, x\ne -8y$
D $\frac{5(2x-y)}{x-8y}, x\ne -\frac{y}{2}, x\ne 8y$

____ **57.** What is the simplified version of the rational expression $\frac{-3x+12}{32-8x}$?

A $\frac{3}{8}(x-4)$ **C** $\frac{3}{8}$

B $x-4$ **D** $-\frac{3}{8}$

____ **58.** When fully simplified, ignoring non-permissible values, $\frac{6x^9}{3x^3} \times \frac{x^8}{9x^6}$ is equal to

A $\frac{2}{9}x^8$ **C** $\frac{2}{9}x^4$

B $\frac{9}{2}x^4$ **D** $\frac{9}{2}x^8$

____ **59.** When fully simplified, ignoring non-permissible values, $\frac{12x^{12}}{4x^3} \div \frac{x^8}{24x^6}$ is equal to

A $72x^3$ **C** $\frac{1}{72}x^3$

B $\frac{1}{72}x^7$ **D** $72x^7$

____ **60.** Simplify the rational expression $\frac{6a^4b^7}{(3ab)^2} \times \frac{(a^4b^7)^2}{(3ab^4)^3}$.

A $\frac{2}{243}a^5b^7$ **C** $\frac{2}{81}a^5b^7$

B $\frac{2}{243}a^7b^7$ **D** $\frac{2}{81}a^7b^7$

____ **61.** Simplify the rational expression $\frac{4x^8y^5}{(2xy)^3} \div \frac{(x^8y^5)^3}{(2xy^8)^4}$. Express your answer with positive exponents only.

A $8x^{33}y^3$ **C** $\frac{1}{32}\frac{y^{19}}{x^{33}}$

B $8\frac{y^{19}}{x^{15}}$ **D** $\frac{1}{32}\frac{x^{33}}{y^3}$

____ **62.** Express the product $\frac{x^2+6x}{2x^2+15x+27} \times \frac{x+3}{x^2-36}$ in simplest form.

A $\frac{(x^2+6x)(x+3)}{(2x^2+15x+27)(x^2-36)}$ **C** $\frac{x}{(2x-36)(x+6)}$

B $\frac{x}{(2x+9)(x-6)}$ **D** $-\frac{1}{2x+9}$

____ **63.** Express the quotient $\frac{x^2-5x-24}{x^2-11x+24} \div \frac{2x^2+7x+3}{x^2+x-12}$ in simplest form.

A $\frac{2x+1}{x+4}$

B $\frac{x+4}{2x+1}$

C $\frac{(x+3)(2x+1)}{(x-3)(x+4)}$

D $\frac{(x-3)(x+4)}{(x+3)(2x+1)}$

____ **64.** When fully simplified, ignoring restrictions on the variable, $\frac{6xy-8}{x^2y^2} + \frac{-3-7xy}{7xy}$ is equal to

A $\frac{3xy-15}{7x^2y^2}$

B $\frac{-7x^2y^2+39xy-56}{7x^2y^2}$

C $\frac{-7x^2y^2+39xy-56}{7x^3y^3}$

D $\frac{-xy-11}{7x^3y^3}$

____ **65.** When fully simplified, ignoring restrictions on the variable, $\frac{x+8}{x^2+9x+20} + \frac{x+5}{x^2+7x+12}$ is equal to

A $\frac{2x+13}{2x^2+16x+32}$

B $\frac{(x+8)(x+5)}{(x^2+9x+20)(x^2+7x+12)}$

C $\frac{2x^2-21x-49}{(x+5)(x+4)(x+3)}$

D $\frac{2x^2+21x+49}{(x+5)(x+4)(x+3)}$

____ **66.** Solve the rational equation $\frac{x}{x+1} = \frac{4-x}{x^2-3x-4} + \frac{6}{x-4}$.

A $x = 10$

B $x = 4$ and -1

C $x = -10$

D $x = -10$ and 1

____ **67.** Determine the value of the absolute value expression $5|(-8-(-9))|$.

A –5

B 85

C –85

D 5

____ **68.** Evaluate $|-5+6^2| - |8-(-9)| + |2-5| + |-4|$.

A 17

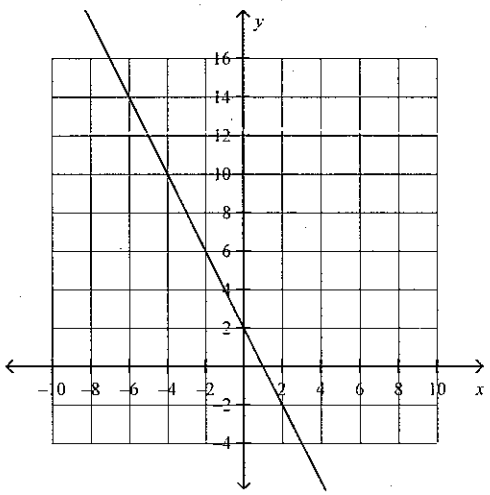
B 21

C 35

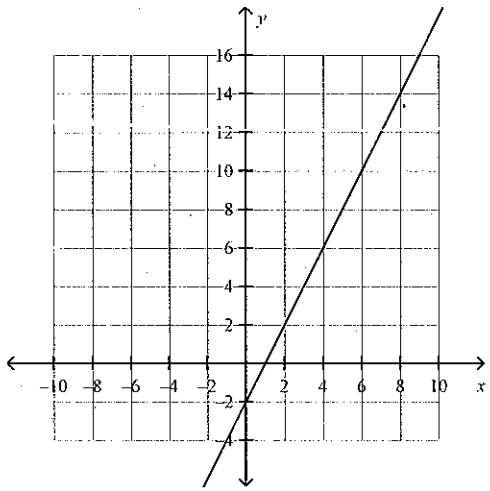
D 25

____ **69.** The graph of $y = |-2x + 2|$ is

A



C



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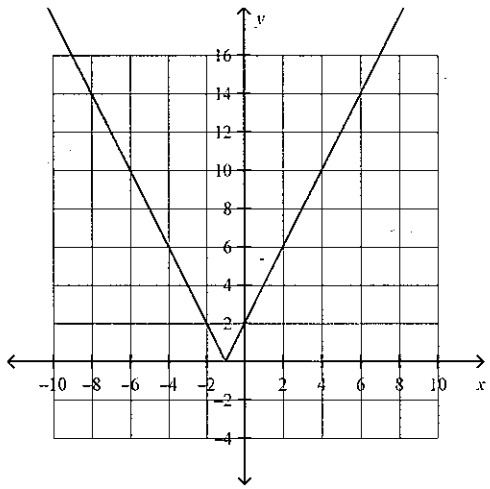

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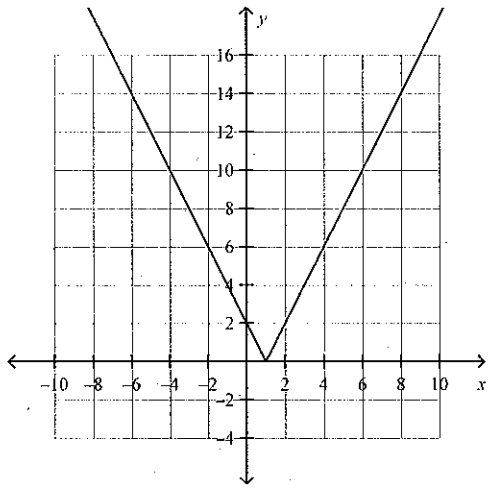


____ **70.** What are the domain and range of $y = \left|6x^2 + 3x - 3\right|$?

A Domain: $\{x | x \in R\}$

Range: $\{y | y \in R\}$

B Domain: $\{y | y \in R\}$

Range: $\{x | x \geq 0, x \in R\}$

C Domain: $\{x | x \leq 0, x \in R\}$

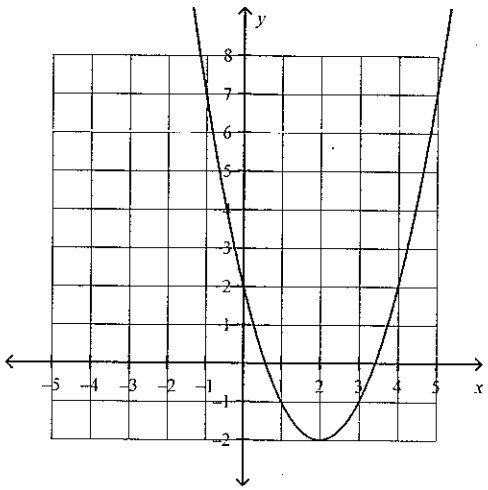
Range: $\{y | y \in R\}$

D Domain: $\{x | x \in R\}$

Range: $\{y | y \geq 0, y \in R\}$

____ **71.** The graph of $y = \left|(x+2)^2 - 2\right|$ is

A



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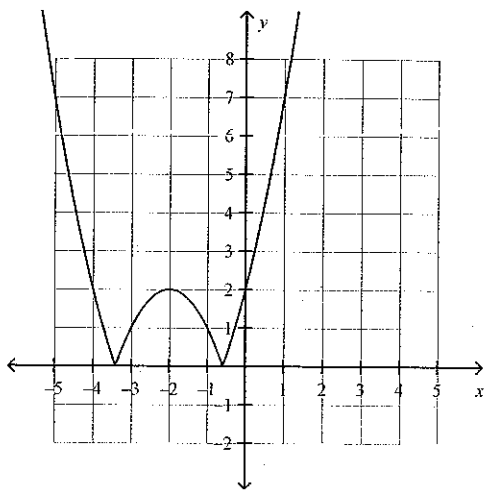

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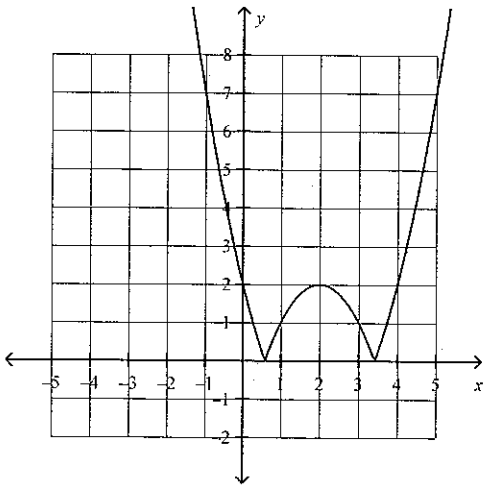

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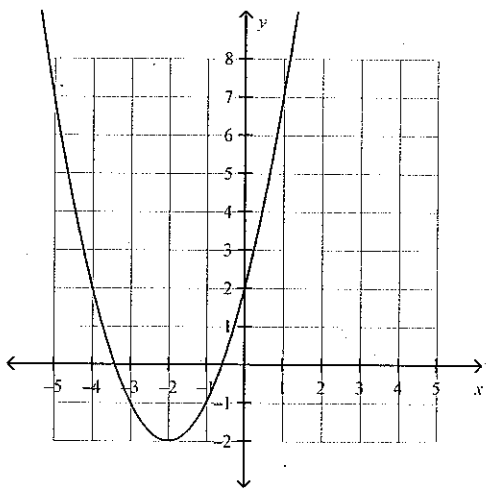


____ **72.** Determine the solution to $|6x+9|+2=8$.

A $x = -\frac{1}{2}$ or $x = -\frac{5}{2}$

B no solution

C $x = \frac{1}{2}$ or $x = \frac{5}{2}$

D $x = \frac{5}{2}$

____ **73.** Determine the solution to $|2x+8|+6=-3$

A $x = -\frac{17}{2}$ or $x = \frac{1}{2}$

B $x = \frac{17}{2}$ or $x = -\frac{1}{2}$

C no solution

D $x = -\frac{1}{2}$

____ **74.** What is the solution to $|4x+8| = -8x+3$?

A $x = -\frac{5}{12}$ or $x = \frac{11}{4}$

B $x = \frac{5}{12}$ or $x = \frac{11}{4}$

C $x = \frac{5}{12}$

D $x = -\frac{5}{12}$

____ **75.** Solve $\left|x^2+3x+3\right| = 3x+7$.

A $x = -2$ and -2

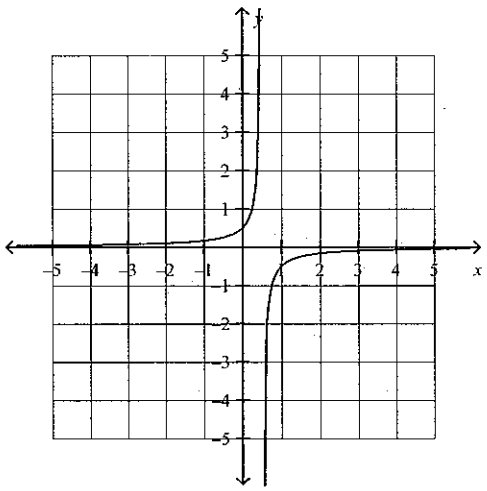
B $x = -2$ and -4

C $x = 2$ and -2

D $x = 2$ and -2

____ **76.** Which graph represents the reciprocal of the linear function $y = 4x - 2$?

A



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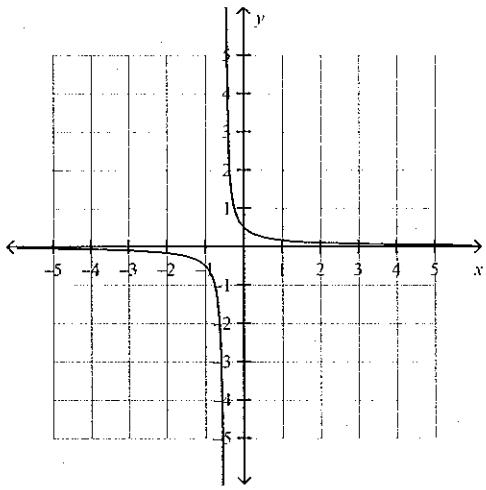
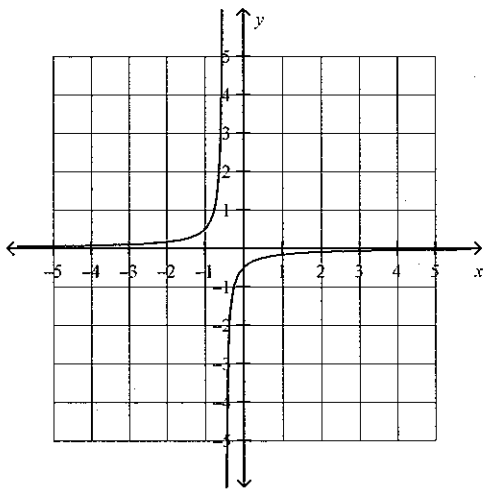


B



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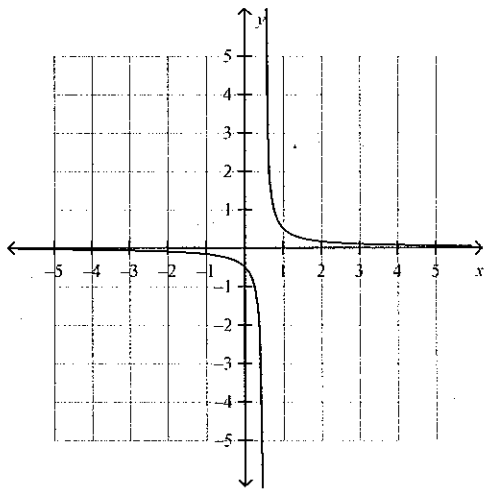
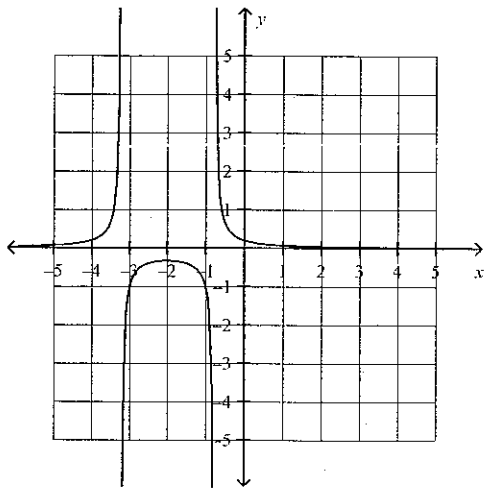
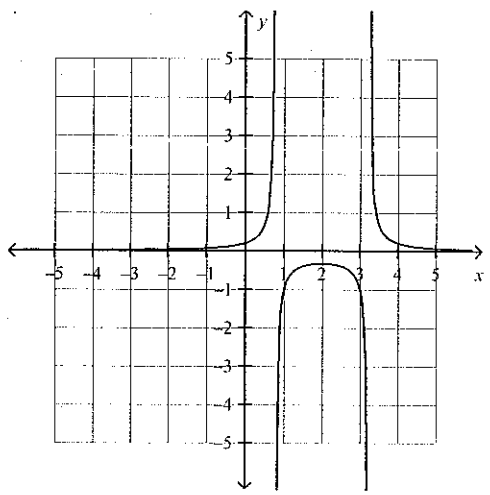


____ **77.** Which graph represents the reciprocal of $y = 2(x+2)^2 - 3$?

A



C



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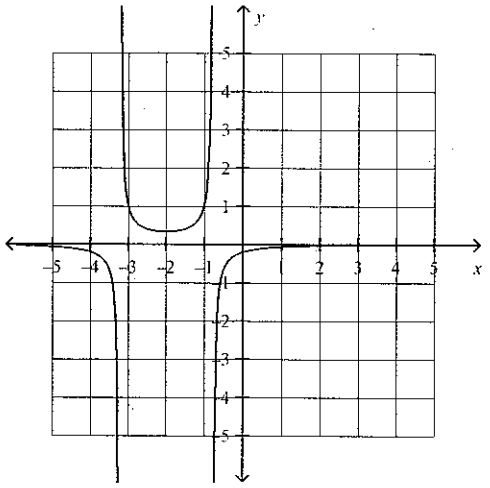
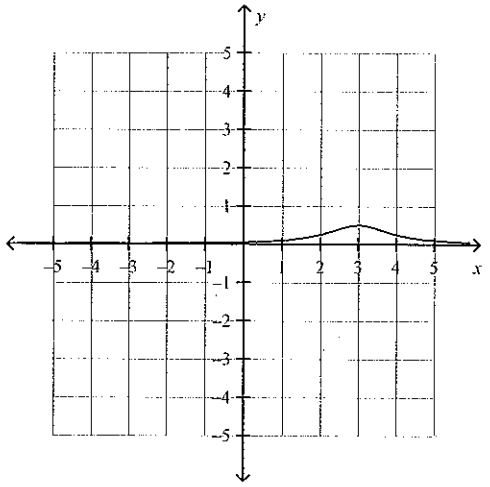


D



____ **78.** The equation of the vertical asymptote for the reciprocal of $y = 8x - 4$ is

A $x = -\frac{1}{2}$

B $x = 2$

C $x = \frac{1}{2}$

D $x = -2$

Completion

Complete each statement.

1. The expression cos 30° is equivalent to sin _____.

2. An angle between 0° and 360° that has the same sine value as sin 133° is _____.

3. A quadratic function with vertex (0, 1) and two x-intercepts will open _____.

4. $9 + 17 + 25 + 33 + 41 + \cdots$ is an example of a(n) _____.

5. The geometric sequence 20, 60, 180, 540, …, 393 660 has _____ terms.

6. The sum of the first 8 terms of the geometric series $5 - 15 + 45 - 135 + \cdots$ is _____.

7. The ratio used to generate the infinite geometric series $-2.5 + 0.5 - 0.1 + 0.02 + \cdots$ is _____.

8. The entire radical $\sqrt[4]{243x^{12}}$ converted to a mixed radical in simplest form is _____.

9. When the denominator in the expression $\frac{7\sqrt{11}}{-9-\sqrt{33}}$ is rationalized, the equivalent expression is _____.

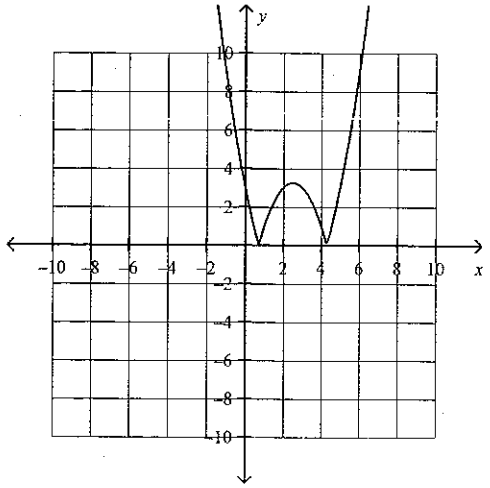
10. The invariant points for the function $f(x) = \frac{1}{x+2}$ are _____ and _____.

Name: _____ ID: A

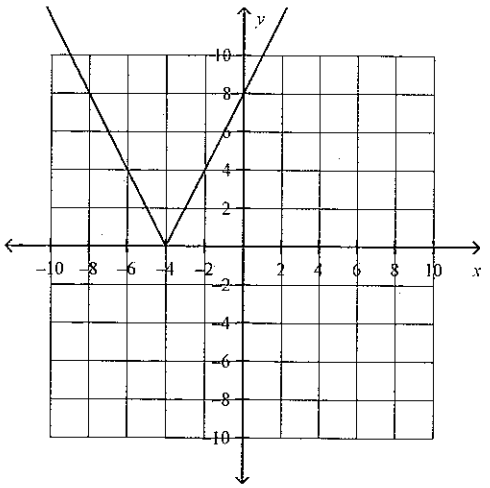
Matching

Match each function to the corresponding graphical representation below.

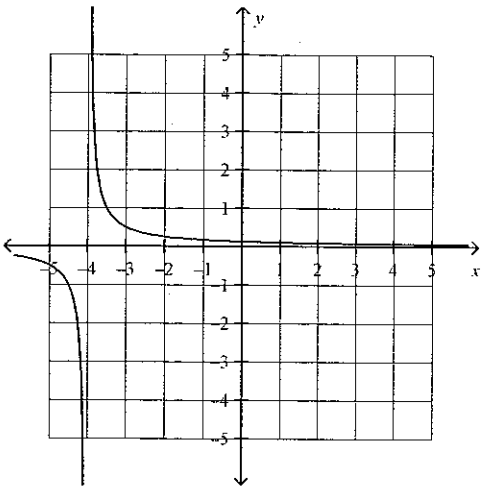
A



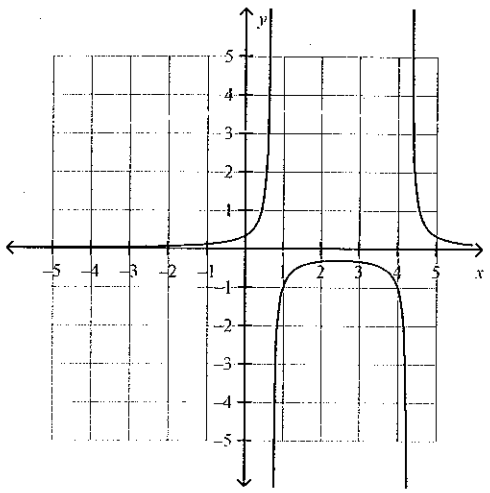
B



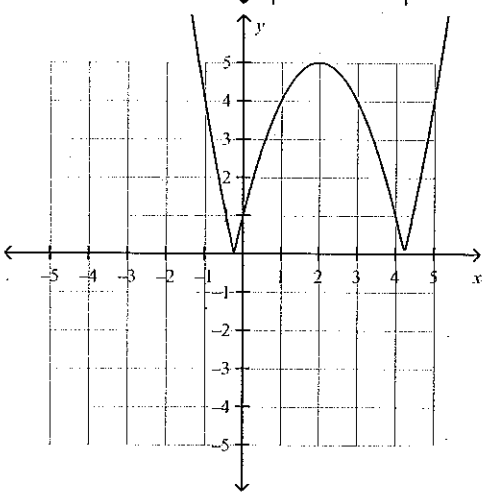
C



D



E



____ **1.** $f(x) = |2x + 8|$

____ 2. $g(x) = \left|x^2 - 5x + 3\right|$

____ 3. $h(x) = \left|(x-2)^2 - 5\right|$

____ 4. $k(x) = \dfrac{1}{2x+8}$

____ 5. $j(x) = \dfrac{1}{x^2 - 5x + 3}$

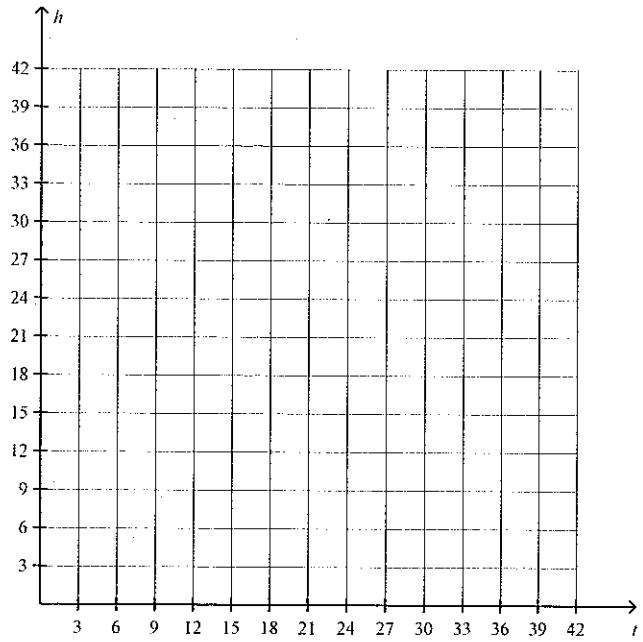
Short Answer

1. In acute $\triangle$NOP, $o = 7$ cm, $p = 9$ cm, and $\angle O = 50°$. Solve $\triangle$NOP. What type of triangle is this?

2. **a)** For the given trigonometric ratio, determine one other angle that gives the same value.
   i) sin 45°
   ii) tan 300°
   iii) cos 120°
   b) Explain how you determined the angles in part a).

3. Suppose a person on the surface of an asteroid kicks a ball. The table shows the height, h, in metres, of the ball over time, t, in seconds, after it is kicked into the air.
a) Graph the data.
b) Write the quadratic relation in vertex form that models this situation.
c) What is the equation of the relation in standard form?

t	h
0	0
3	16.2
6	28.8
9	37.8
12	43.2
15	45
18	43.2
21	37.8
24	28.8
27	16.2
30	0



4. Express the quadratic function $y = -3x^2 + 12x - 10$ in vertex form.

5. Factor the quadratic $6(x-5)^2 + 126(x-5) + 324$ completely.

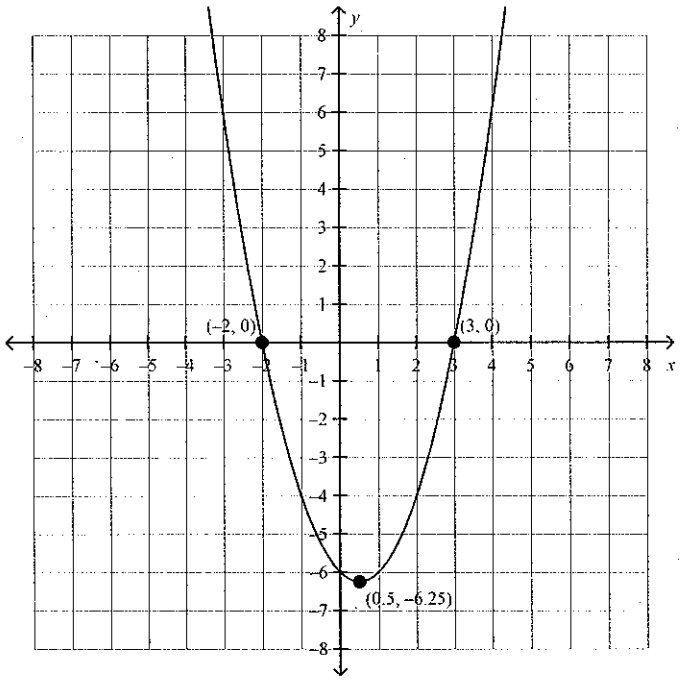
6. Solve the quadratic function $y = 5x^2 + 20x - 6$ by completing the square. Round roots to the nearest hundredth, if necessary.

7. Use the quadratic formula to find the roots of the equation $x^2 + 4x - 21 = 0$. Express your answers as exact roots.

8. Determine the number of real roots for the equation $3x^2 = 8x - 4$. Then, find the roots of the equation by
a) using the quadratic formula
b) factoring

9. Find the x-intercepts of the quadratic function $y = 3x^2 - 10x + 6$. Express your answers as exact values.

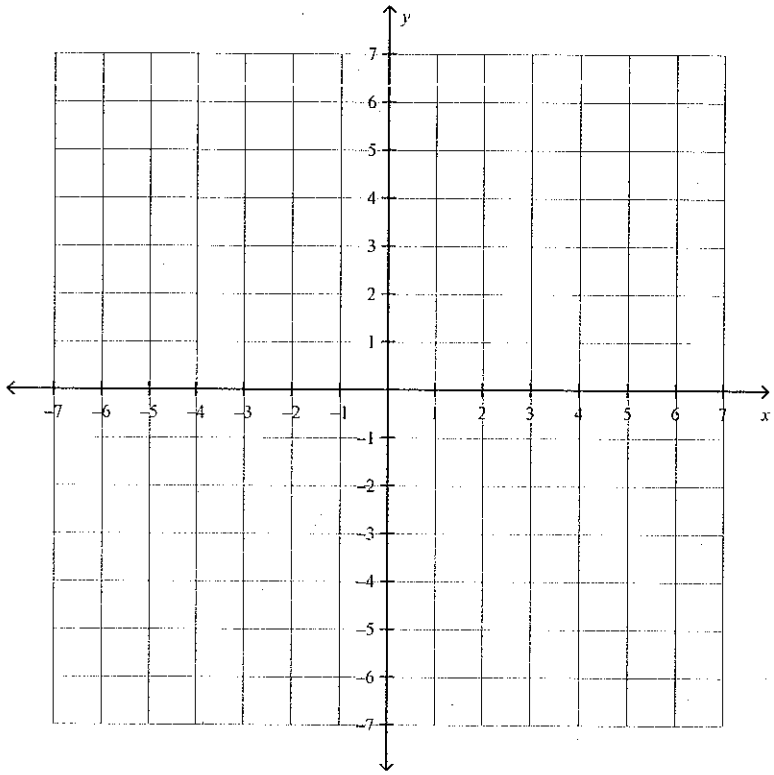
10. Write the equation of this parabola.



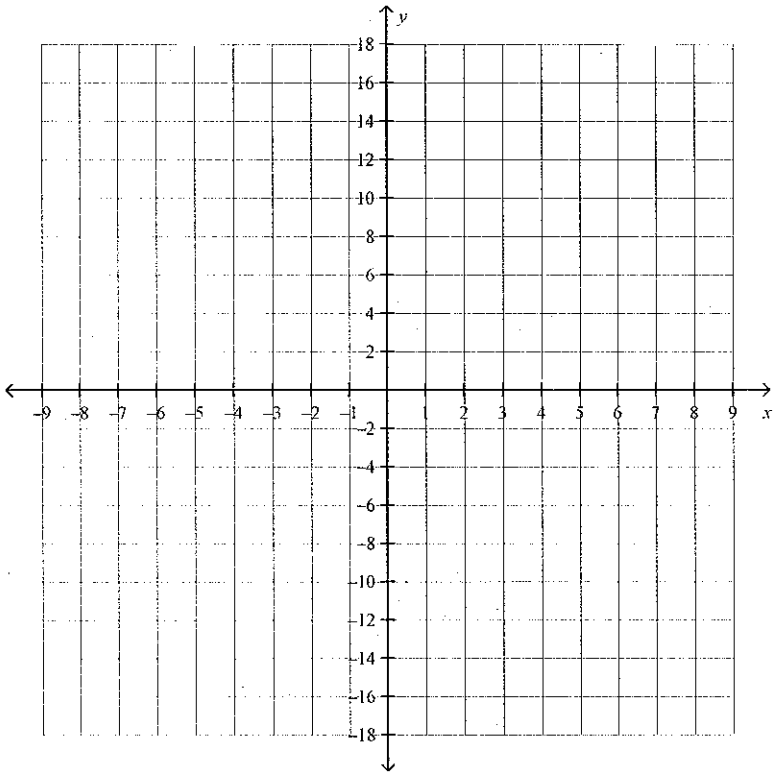
11. Solve the system graphically.

$y = 2x - 4$

$y = x^2 - 4$



12. Solve the system graphically.
$y = x^2 - 16$
$y = -(x+4)^2$



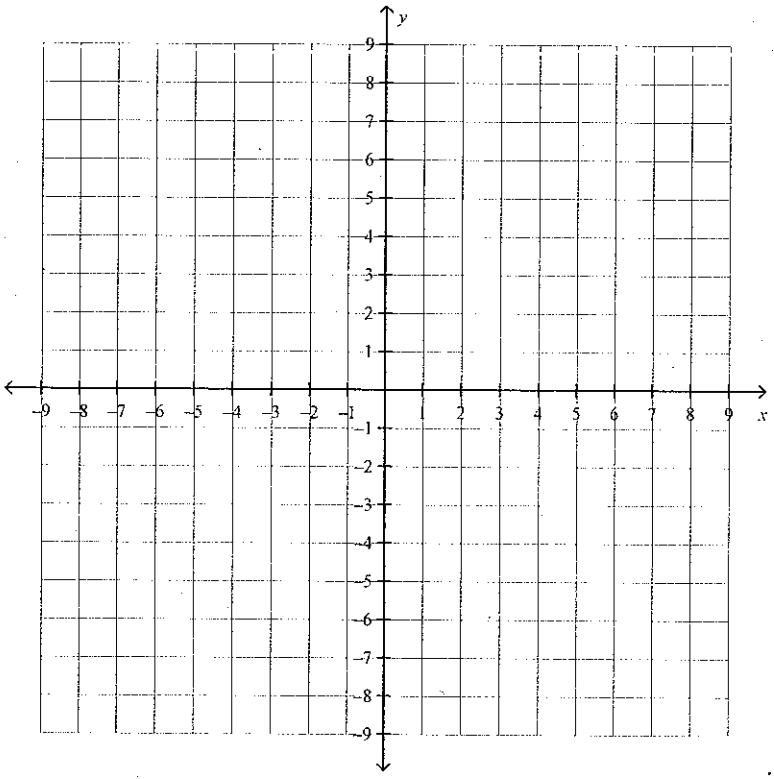
13. Determine the number of points of intersection for the line $y = 3x + 5$ and the curve $y = 2x^2 + 4x - 1$.

14. Solve the system of equations by elimination.
$y = 2x^2 - 2x - 3$ and $y = -x^2 - 2x - 3$

15. Solve the system of equations using substitution. State your answers to two decimal places.
$y = -3x^2 - 3x + 2$ and $y = -6x^2 + 4x + 7$

16. Which of the given ordered pairs belong to the solution to the inequality $y \geq 3x - 5$? Use a graph of the inequality to show your reasoning in each case.

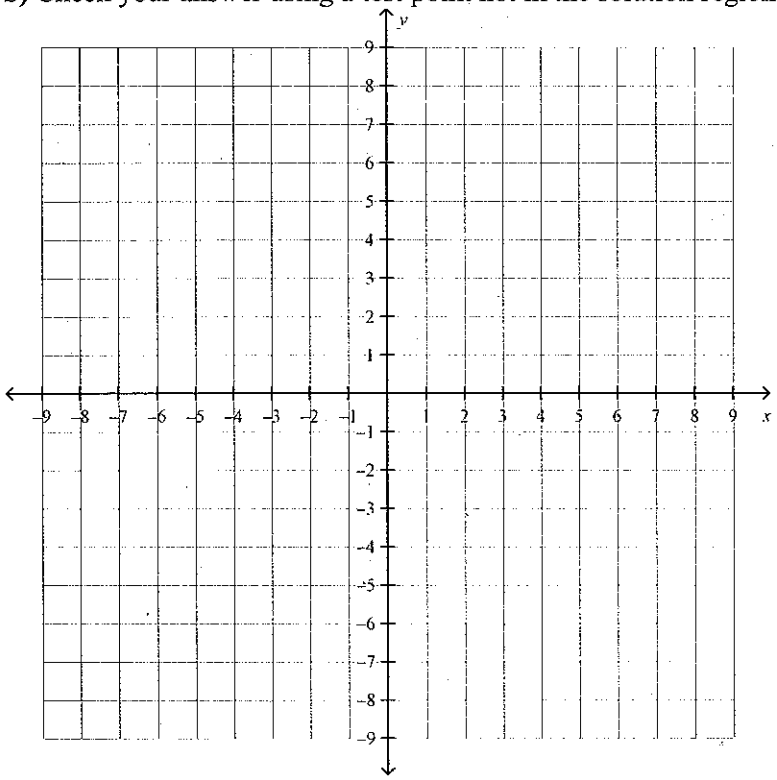
(2,2), (–1,–9), (1,–2), (0,0)



17. What is the solution for $2x^2 - 7x \geq -3$?

18. **a)** Sketch the graph of the quadratic inequality $y \leq -\frac{2}{3}(x-3)^2 - 1$.

b) Check your answer using a test point not in the solution region you graphed..



19. The starting wage at a bookstore is $8.50 per hour with a yearly increase of $0.75 per hour.
a) Write the general term of the sequence representing the hourly rate earned in each year.
b) Use your expression from part a) to determine the hourly rate after 6 years.
c) How many years will someone need to work at the store to earn $15.25 per hour?

For each geometric sequence, determine
a) *an explicit formula for the general term*
b) t_{11}

20. $t_1 = 3, r = 2$

21. $3, 2, \frac{4}{3}, \frac{8}{9}, \frac{16}{27}, \ldots$

For each arithmetic series, determine
a) *an explicit formula for the general term*
b) *a formula for the general sum*
c) t_{12}
d) S_n

22. $-12-9-6-\cdots+12$

23. Find the value of t_1 given $S_8=-3280$ and $r=-3$. Be sure to show all of your work.

24. If $S_1=0.7$ and $S_2=2.1$ in a geometric series, determine the sum of the first 12 terms in the series. Be sure to show all of your work.

25. Without using a calculator, arrange the following in order from least to greatest.
a) $3\sqrt{5}, 2\sqrt{11}, 4\sqrt{3}, 5\sqrt{2}$
b) $5\sqrt{5}, 4\sqrt{7}, 3\sqrt{14}, 2\sqrt{30}$

26. Simplify each expression.
a) $\sqrt{20}+\sqrt{5}$
b) $5\sqrt{12}-2\sqrt{27}$
c) $\sqrt{3}\left(\sqrt{5}+\sqrt{7}\right)$
d) $\dfrac{24\sqrt{14}}{8\sqrt{2}}$

27. Simplify each expression.
a) $\sqrt{162}$
b) $5\sqrt{2}-2\sqrt{5}+\sqrt{125}-\sqrt{8}$
c) $\sqrt{3}(4\sqrt{6}+2\sqrt{3})$
d) $\sqrt{2}(2\sqrt{2}+2)-3(5\sqrt{2}+1)$

28. Solve $4-\sqrt{4+x^2}=x$.

29. Solve $\sqrt{b+1}=\sqrt{b+6}-1$.

Simplify each expression and state any non-permissible values.

30. $\dfrac{x^2-2x}{x+1}\times\dfrac{x^2-1}{x^2+x-6}$

31. $\dfrac{4x-1}{x^2+7x+12}\div\dfrac{2x-1}{x^2+x-12}$

Simplify each expression and state any non-permissible values.

32. $\dfrac{x}{x^2-3x-4}-\dfrac{4}{x+1}$

33. $\dfrac{5}{x^2-1}-\dfrac{2}{x^2+4x+3}+\dfrac{3}{x^2+2x-3}$

34. Solve and check.

$\dfrac{5}{x-1}+\dfrac{2}{x+1}=-6$

35. Evaluate each absolute value expression.

a) $6+|5-11|$

b) $-2-|7|+|3-2|$

c) $\dfrac{24}{-|12\div(-2)|}$

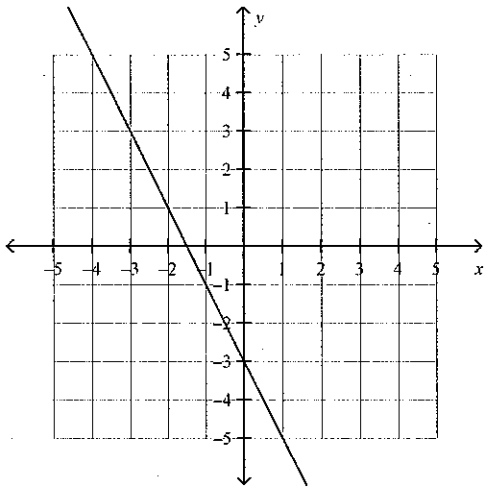
d) $|2|\times\left(-|-3|\right)\times(-2)$

36. Given the graph of $y=f(x)$:

a) sketch the graph of $y=|f(x)|$

b) state the domain and range

c) express $y=f(x)$ as a piecewise function.

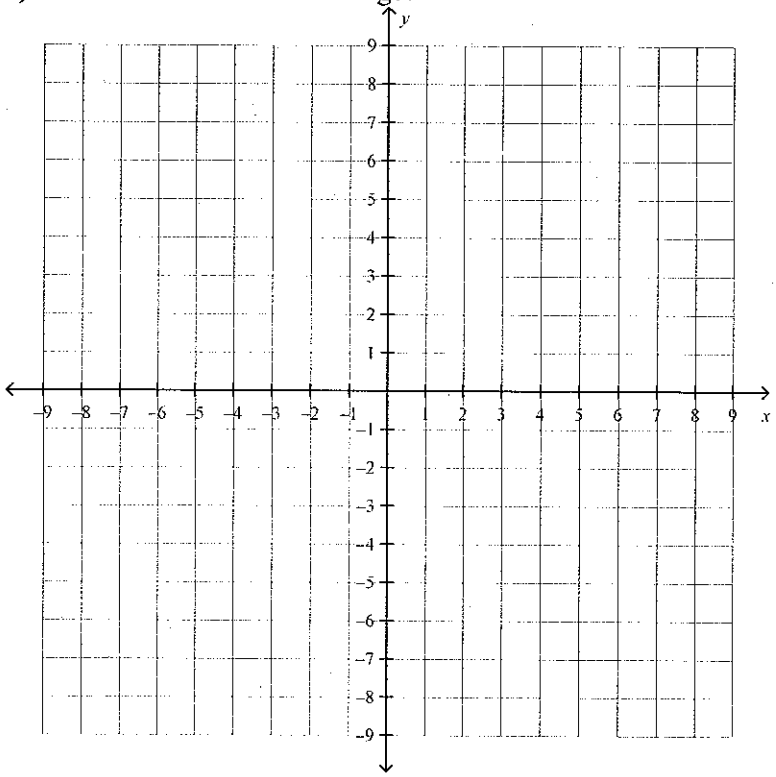


37. Consider the function $f(x) = \left|2x^2 - 16x + 29\right|$.

a) Express the function in vertex form, $y = \left|a\left(x-p\right)^2 + q\right|$.

b) Sketch the graph of the function. Label the vertex and x-intercepts.

c) What are the domain and range?



38. Solve the absolute value equation $\left|\frac{1}{2}x + 1\right| = x + 1$ algebraically.

39. Graph each reciprocal function. For each graph, state the non-permissible values and the equation of the vertical asymptote(s).

a) $y = \frac{1}{3x-2}$

b) $y = \frac{1}{x^2 - 16}$

Problem

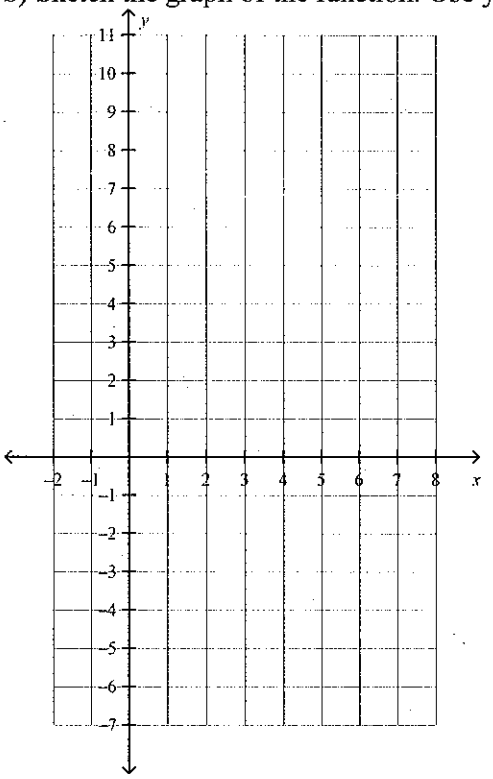
1. **a)** Without using a calculator, determine two angles between 0° and 360° that have a sine ratio of $-\frac{1}{2}$.

b) Use a calculator and a diagram to verify your answers to part a).

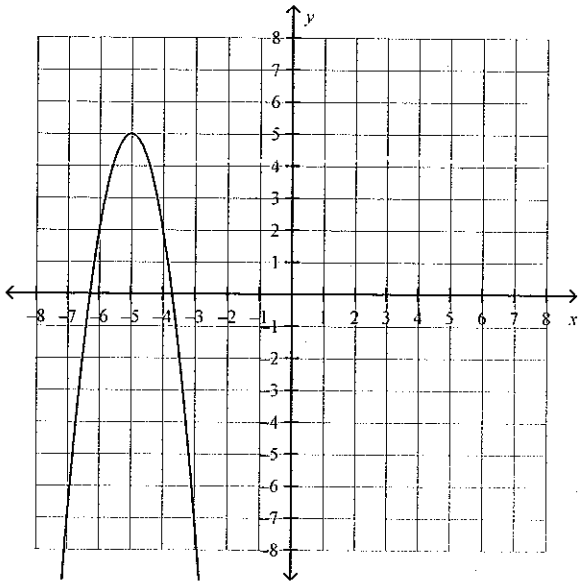
2. Consider $\angle A$ such that $\cos A = \frac{12}{13}$.

   a) In which quadrant(s) is this angle? Explain.
   b) If the sine of the angle is negative, in which quadrant is the angle? Explain.
   c) Sketch a diagram to represent the angle in standard position, given that the condition in part b) is true.
   d) Find the coordinates of a point on the terminal arm of the angle.
   e) Write exact expressions for the other two primary trigonometric ratios for the angle.

3. **a)** Write the function $y = -(x - 2)^2 + 9$ in standard form.
   b) Sketch the graph of the function. Use your answer to part a) to identify the y-intercept.



4. Write the equation of the quadratic function illustrated by the graph, in vertex form.



5. A store can increase its profit by increasing the price of the sweaters it sells. The relation between the income, R, and the dollar increase in the price per sweater, d, can be modelled by the equation $R = -50(d - 3.5)^2 + 4500$.

a) What is the maximum possible income?

b) What would the income be if the price per sweater were increased by $10?

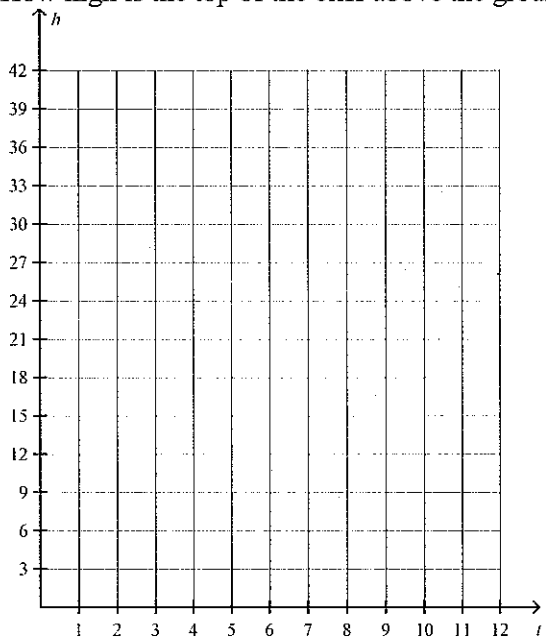
6. A ball is thrown straight up from the edge of a cliff and falls to the ground below. The height, h, in metres, of the ball above the ground t seconds after being thrown is approximately modelled by the relation $h = -5t^2 + 10t + 35$.

a) Determine the maximum height of the ball above the ground by writing the equation in vertex form.

b) How long does it take for the ball to reach the maximum height?

c) After how many seconds does the ball hit the ground?

d) How high is the top of the cliff above the ground?



7. Supermarket cashiers try to memorize current sale prices while they work. A survey shows that, on average, the percent, P, of prices memorized after t hours is modelled by the relation $P = -40t^2 + 120t$.

a) What is the greatest percent of prices memorized?

b) How long does it take to memorize this greatest percent?

8. The path of a parabolic arch is given by $h(d) = -0.025d^2 + d$, where h is the height of the arch above the ground, and d is the horizontal width of the arch from the left base, both in metres. How far is the right base from the left?

9. The height, h, in metres, of an infield fly ball t seconds after being hit is approximately modelled by the quadratic relation $h = 30t - 5t^2$. How long is the ball in the air?

10. A uniform border on a framed photo has an area four times that of the photo. What are the outside dimensions of the border if the dimensions of the photo are 30 cm by 20 cm?

11. The Parthenon, in Athens, is a temple to the Greek goddess Athena, and was built in about 447 B.C.E. It has a rectangular base with a perimeter of approximately 202 m and an area of 2170 m^2. Find the dimensions of the base, to the nearest metre.

12. For a science experiment, a projectile is launched. Its path is given by $h(d) = -5d^2 + 24d + 30$, where h is the height of the projectile above the ground and d is the horizontal distance of the projectile from the launch pad, both in metres. How far away from the launch pad was the projectile when it landed, to the nearest tenth of a metre?

13. A parachutist jumps from an airplane and immediately opens his parachute. His altitude, y, in metres, after t seconds is modelled by the equation $y = -4t + 300$. A second parachutist jumps 5 s later and free-falls for a few seconds. Her altitude, in metres, during this time, is modelled by the equation $y = -4.9(t-5)^2 + 300$. When does she reach the same altitude as the first parachutist (to the nearest tenth)?

14. Solve the system algebraically.

$y = 4x^2 + 13$

$y + 7 = 4x^2$

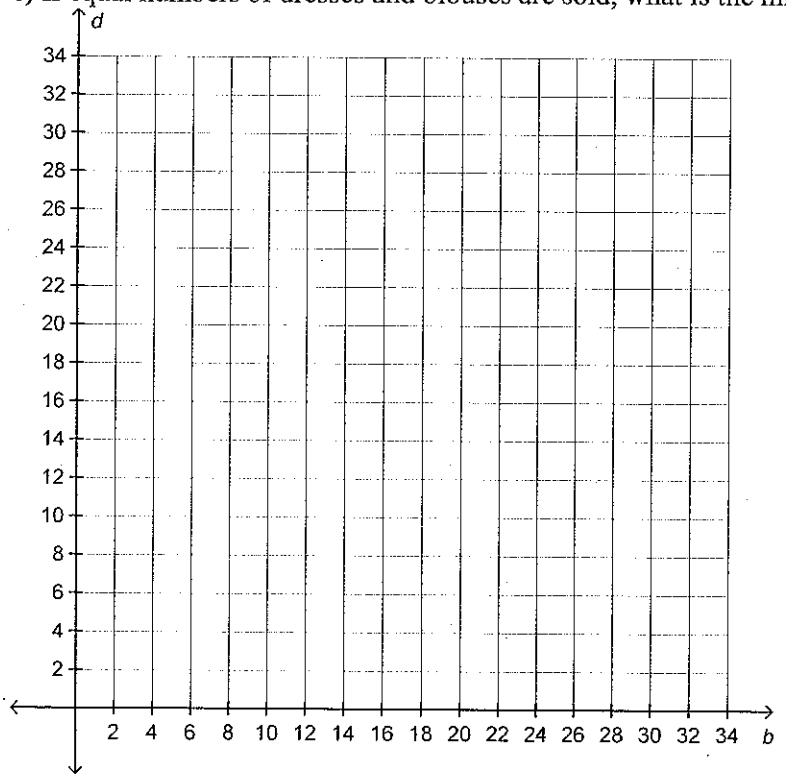
15. A sheet-metal worker must cut a rectangular sheet with a diagonal of 15 cm long and a perimeter of 42 cm. What length and width should be used?

16. A women's clothing store makes an average profit of $125 on each dress sold and $50 on each blouse. The manager's target is to make at least $500 a day on sales from dresses and blouses.

a) What inequality represents the numbers of dresses and blouses that can be sold each day to reach the target?

b) Graph the inequality.

c) If equal numbers of dresses and blouses are sold, what is the minimum number needed to reach the target?



17. Etienne owns a small recycling company that picks up empty glass bottles from restaurants. At the first restaurant, he picks up 50 bottles. At each restaurant after this, he picks up 4 more bottles than he picked up at the restaurant before. Assume that this pattern continues.
a) Write the first four terms of the arithmetic sequence that represents the number of bottles he picks up at a restaurant.
b) Determine a and d for the sequence.
c) How many bottles will he have picked up after stopping at the eighth restaurant?
d) If his truck can hold 2000 empty bottles, will he be able to pick up bottles at the 21st restaurant without emptying the truck first?

18. A company purchases a new computer system valued at $42 000. For income tax purposes, an accountant determines that the annual depreciation rate (rate of decrease in value) for the equipment is 11%.
a) Make a table of values to show the value of the system over the first 5 years.
b) Determine an explicit formula in function notation to model the value of the system in year n.
c) What is the value of the system at the end of year 20?
d) How realistic is the answer to part c)? Explain.

19. Write each repeating decimal number as an equivalent fraction in lowest terms.
a) $0.5555...$
b) $0.1\overline{2}$

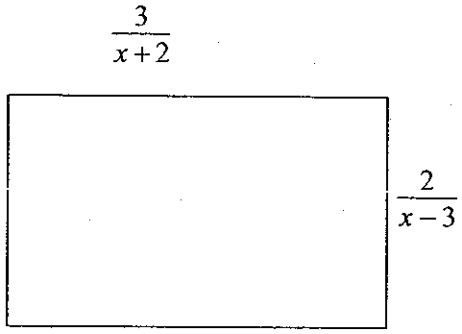
20. The measures of the legs of a right triangle can be represented by the expressions $4x^2y^2$ and $8x^2y^2$. What is a simplified expression for the measure of the hypotenuse?

21. Is the equation $\sqrt{ab} = (\sqrt{a})(\sqrt{b})$ true for negative values of a and b? Explain your reasoning.

22. The formula $s = 2\pi\sqrt{\frac{l}{32}}$ represents the swing of a pendulum, where s is the time, in seconds, to swing back and forth, and l is the length of the pendulum, in feet.
a) Solve the formula for l.
b) What is the length of a pendulum that makes one swing in 1.5 s?

23. In a triathlon, a contestant swims 5 km, cycles 30 km, and then runs 20 km. In general, a contestant runs at an average speed of x, swims at an average speed of $\frac{x}{5}$, and cycles at an average speed of $5x$, where x is in kilometres per hour.
a) Determine an expression for the total time taken to complete the race.
b) Cynthia can swim at 2 km/h. How long will it take her to complete the race?
c) If Shaitha can cycle at 40 km/h, how much longer will it take her to complete the race, compared to Cynthia?

24. The rectangle has a perimeter of 5 units. What is the value of x?



25. Jerry jogged 9 km in an hour. He covered the last 4 km at a speed that was 2 km/h slower than his speed over the first 5 km. What was his speed over the first 5 km?

26. A car and a bus left Regina at the same time. The car drove 480 km west to Calgary. The bus drove 570 km east to Winnipeg. The bus travelled 15 km/h faster than the car. The car and the bus arrived at their destinations at the same time. What were the speeds of the car and the bus?