

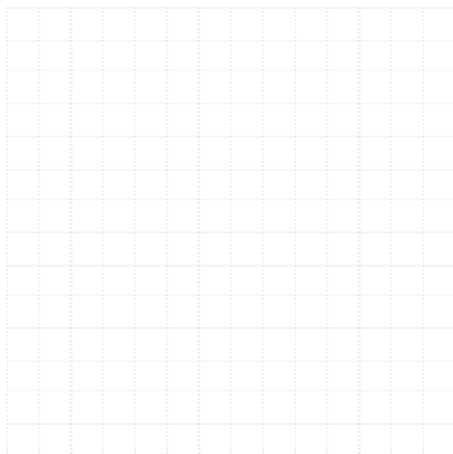
Pre-Calc 11 Final Review**Short Answer**

1. Solve.

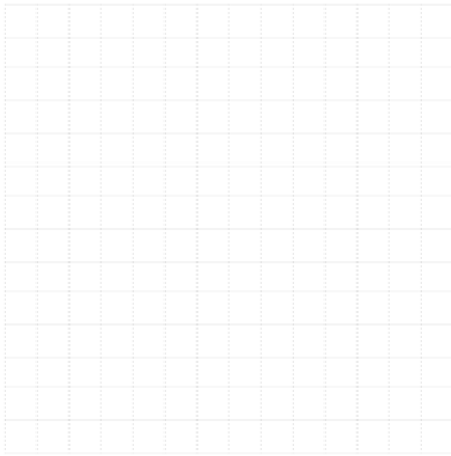
$$\frac{5}{h+2} - \frac{5h-14}{h^2-h-6} = \frac{h}{h-3}$$

2. Devon travels 120 km to Edmonton by car, and then returns by bus. The average speed of the car is 15 km/h greater than the average speed of the bus. If Devon's total travel time is 216 min, what is the average speed of the bus?
3. Write this equation in standard form: $y = -2x^2 + 16x - 28$
4. Simplify by adding or subtracting like terms: $\sqrt{32w} + 2\sqrt{2w} - \sqrt{128w}$, $w \geq 0$
5. Expand and simplify this expression: $(2\sqrt{5} - 7\sqrt{3})(-7\sqrt{5} - 6\sqrt{3})$
6. Rationalize the denominator: $\frac{7}{7\sqrt{5}}$
7. Determine the root of each equation.
- $\sqrt{2x-6} = 4$
 - $3\sqrt{2x-3} = 2\sqrt{2x} + 1$
 - $\sqrt{6x+1} = \sqrt{2x-5}$
 - $12 = \sqrt{168-4x}$
8. Factor this polynomial: $12x^2 + 5x - 28$
9. Factor this polynomial expression: $48(4x-1)^2 - 75(2y+3)^2$
10. Solve this equation: $\sqrt{x^2+4} + 2 = 5x$
11. Solve this equation: $(x+2)^2 - 5(x+2) - 14 = 0$
12. Solve this equation: $(3x-5)^2 = 14$
13. Solve this quadratic equation: $2x(x-5) = 3(x-5) + 3$
14. a) Determine the value of the discriminant for this equation: $3x^2 - 5x - 12 = 0$
b) Use the value of the discriminant to choose a solution strategy, then solve the equation.

15. Use a graphing calculator to graph the quadratic function $y = -3x^2 - 3x + 3$.
Determine:
- the intercepts
 - the coordinates of the vertex
 - the equation of the axis of symmetry
 - the domain of the function
 - the range of the function
- Write your answers to the nearest hundredth, if necessary.
16. Determine an equation of a quadratic function with x -intercepts of 2 and 6, that passes through the point L(3, 12).
17. Determine the x - and y -intercepts, the equation of the axis of symmetry, and the coordinates of the vertex of the graph of $y = -2x^2 + 8x - 6$.
18. A book store sells dictionaries for \$22. At this price, the store sells approximately 100 dictionaries per week. The store manager estimates that for every \$0.50 decrease in price, the store will sell 25 more dictionaries. Determine the price of a dictionary that will maximize the revenue.
19. Represent the solution of this quadratic inequality on a number line: $-2x^2 - 13x > -24$
20. Graph the inequality: $y \geq \frac{1}{4}x - 3$



21. Graph the inequality: $y < 2x^2 + 2$



22. Solve this quadratic-quadratic system algebraically.

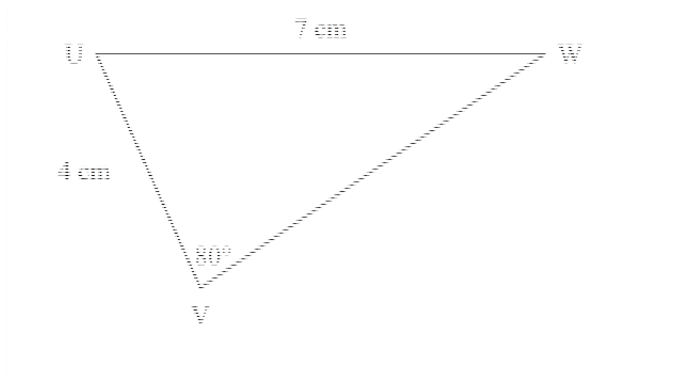
$$y = (x - 2)^2$$

$$y = -2x^2 + 2x + 4$$

23. Given the following information about $\triangle ABC$, determine how many triangles can be constructed.

$$a = 5.6 \text{ cm}, c = 7.8 \text{ cm}, \angle A = 38^\circ$$

24. Solve $\triangle UVW$. Give angle measures to the nearest degree and side lengths to the nearest tenth of a centimetre.



25. Simplify this rational expression. State the non-permissible values of the variable.

$$\frac{25 - 9p^2}{36p^2 - 100}$$

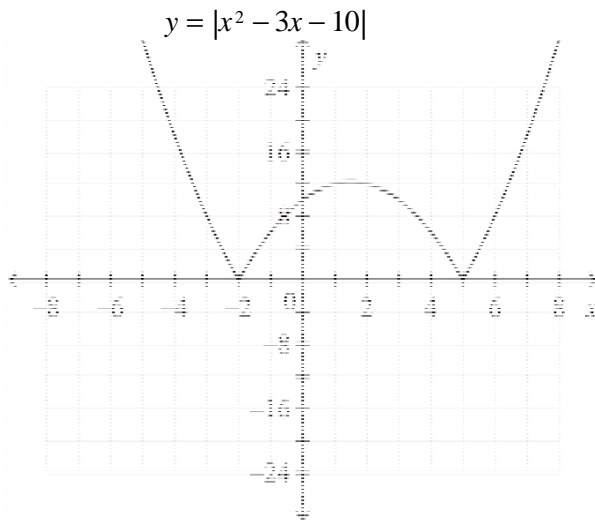
26. Simplify this expression:

$$\frac{7}{q-2} \cdot \frac{2q-4}{q+4}$$

27. Simplify.

$$\frac{x^2 - x - 6}{4x - 12} + \frac{x^2 + 7x + 10}{x^2 + 5x}$$

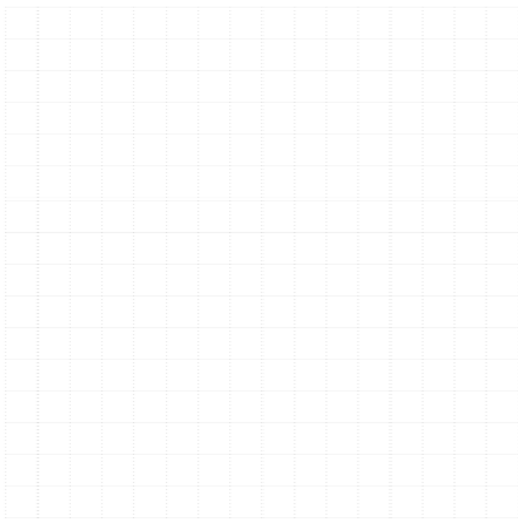
28. Write the absolute value function $y = |x^2 - 3x - 10|$ in piecewise notation.



29. Solve this equation: $|x^2 - 5x - 30| = 6$

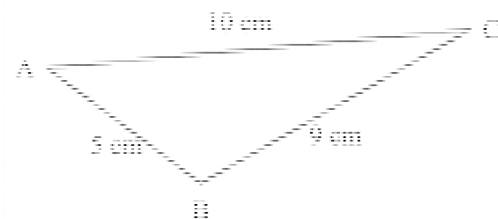
Problem

1. Solve $x^2 - 13x - 7 = 0$ by completing the square. Show your work.
2. Sketch a graph of this quadratic function: $y = 2x^2 - x - 15$
Explain your steps.

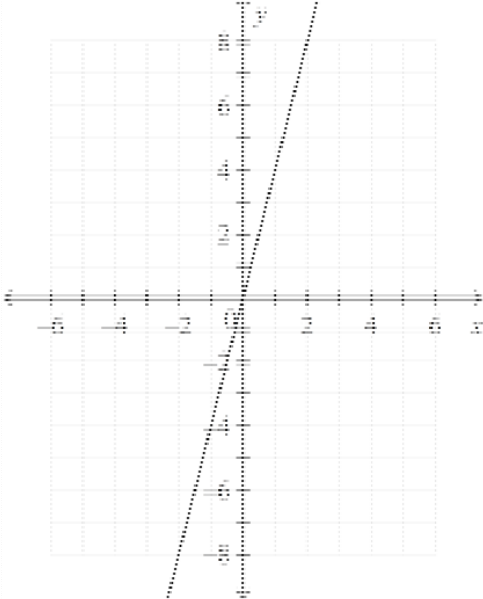


3. Point $P(-1, -5)$ is a terminal point of an angle θ in standard position.
- Determine the ratios $\cos \theta$, $\sin \theta$, and $\tan \theta$.
 - Determine the measure of θ to the nearest degree.
- Show your work.

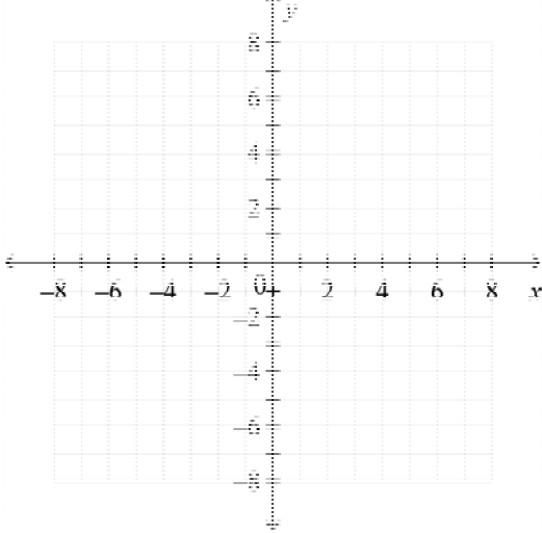
4. Solve $\triangle ABC$. Give angle measures to the nearest degree.



5. Use the graph of $y = f(x)$ to sketch a graph of $y = \frac{1}{f(x)}$. Write the equation of the linear and reciprocal functions. Show your work.



6. The graph of the reciprocal of a quadratic function has one vertical asymptote, $x = 1$. Points $(2, 1)$ and $(0, 1)$ are common to the graphs of the quadratic function and its reciprocal.
- Sketch the graphs of the quadratic function and its reciprocal on the same grid.
 - Determine the equations of both the quadratic function and its reciprocal.
- Describe your strategy.



Pre-Calc 11 Final Review

Answer Section

SHORT ANSWER

1. ANS:

$$h = -1$$

PTS: 0

DIF: Moderate

REF: 7.5 Solving Rational Equations

LOC: 11.AN6

TOP: Algebra and Number

KEY: Procedural Knowledge

2. ANS:

60 km/h

PTS: 0

DIF: Moderate

REF: 7.6 Applications of Rational Equations

LOC: 11.AN6

TOP: Algebra and Number

KEY: Procedural Knowledge | Problem-Solving Skills

3. ANS:

$$y = -2(x - 4)^2 + 4$$

PTS: 0

DIF: Moderate

REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function

LOC: 11.RF4

TOP: Relations and Functions

KEY: Procedural Knowledge

4. ANS:

$$-2\sqrt{2w}$$

PTS: 0

DIF: Easy

REF: 2.3 Adding and Subtracting Radical Expressions

LOC: 11.AN2

TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

5. ANS:

$$56 + 37\sqrt{15}$$

PTS: 0

DIF: Moderate

REF: 2.4 Multiplying and Dividing Radical Expressions

LOC: 11.AN2

TOP: Relations and Functions

KEY: Procedural Knowledge

6. ANS:

$$\frac{7\sqrt{5}}{35}$$

PTS: 0

DIF: Easy

REF: 2.4 Multiplying and Dividing Radical Expressions

LOC: 11.AN2

TOP: Relations and Functions

KEY: Procedural Knowledge

7. ANS:

a) $x = 11$

b) $x = 8$

c) The equation has no real root.

d) $x = 6$

PTS: 0

DIF: Moderate

REF: 2.5 Solving Radical Equations

LOC: 11.AN3

TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

8. ANS:
 $(4x + 7)(3x - 4)$

PTS: 0 DIF: Easy REF: 3.1 Factoring Polynomial Expressions
 LOC: 11.RF1 TOP: Relations and Functions KEY: Procedural Knowledge

9. ANS:
 $3(16x + 10y + 11)(16x - 10y - 19)$

PTS: 0 DIF: Moderate REF: 3.1 Factoring Polynomial Expressions
 LOC: 11.RF1 TOP: Relations and Functions KEY: Procedural Knowledge

10. ANS:

$$x = \frac{5}{6}$$

PTS: 0 DIF: Moderate REF: 3.2 Solving Quadratic Equations by Factoring
 LOC: 11.AN3 TOP: Algebra and Number KEY: Procedural Knowledge

11. ANS:

$$x = 5 \text{ or } x = -4$$

PTS: 0 DIF: Moderate REF: 3.2 Solving Quadratic Equations by Factoring
 LOC: 11.RF5 TOP: Relations and Functions KEY: Procedural Knowledge

12. ANS:

$$x = \frac{5}{3} \pm \frac{\sqrt{14}}{3}$$

PTS: 0 DIF: Easy REF: 3.3 Using Square Roots to Solve Quadratic Equations
 LOC: 11.RF5 TOP: Relations and Functions KEY: Procedural Knowledge

13. ANS:

$$x = \frac{13 \pm \sqrt{73}}{4}$$

PTS: 0 DIF: Moderate REF: 3.4 Developing and Applying the Quadratic Formula
 LOC: 11.RF5 TOP: Relations and Functions KEY: Procedural Knowledge

14. ANS:

a) $b^2 - 4ac = 169$

b) The discriminant is a perfect square, so use factoring.

$$x = -\frac{4}{3} \text{ or } x = 3$$

PTS: 0 DIF: Moderate REF: 3.5 Interpreting the Discriminant
 LOC: 11.RF5 TOP: Relations and Functions
 KEY: Conceptual Understanding | Procedural Knowledge

15. ANS:

- a) x -intercepts: -1.62 and 0.62
 y -intercept: 3
- b) vertex: $(-0.5, 3.75)$
- c) axis of symmetry: $x = -0.5$
- d) domain: $x \in \mathbb{R}$
- e) range: $y \leq 3.75, y \in \mathbb{R}$

PTS: 0 DIF: Moderate REF: 4.1 Properties of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

16. ANS:

$$y = -4(x - 4)^2 + 16$$

PTS: 0 DIF: Difficult

REF: 4.4 Analyzing Quadratic Functions of the Form $y = a(x - p)^2 + q$

LOC: 11.RF3 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

17. ANS:

y -intercept: -6

x -intercepts: 1 and 3

equation of the axis of symmetry: $x = 2$

coordinates of the vertex: $(2, 2)$

PTS: 0 DIF: Moderate

REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$

LOC: 11.RF4 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

18. ANS:

\$12

PTS: 0 DIF: Moderate

REF: 4.7 Modelling and Solving Problems with Quadratic Functions

LOC: 11.RF4 TOP: Relations and Functions

KEY: Problem-Solving Skills | Procedural Knowledge

19. ANS:

The solution is: $-8 < x < 1.5, x \in \mathbb{R}$

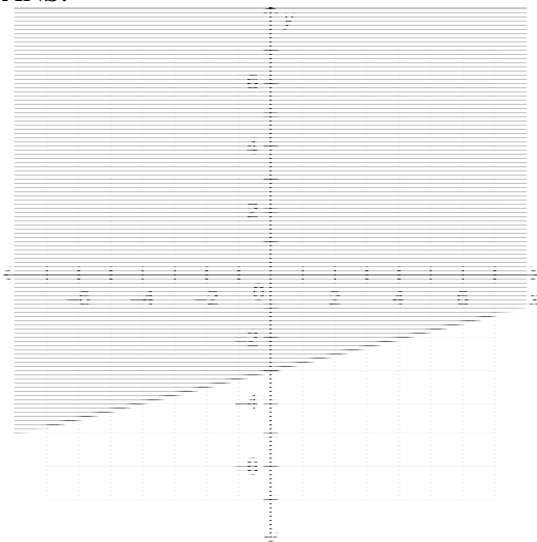


PTS: 0 DIF: Moderate REF: 5.1 Solving Quadratic Inequalities in One Variable

LOC: 11.RF8 TOP: Relations and Functions

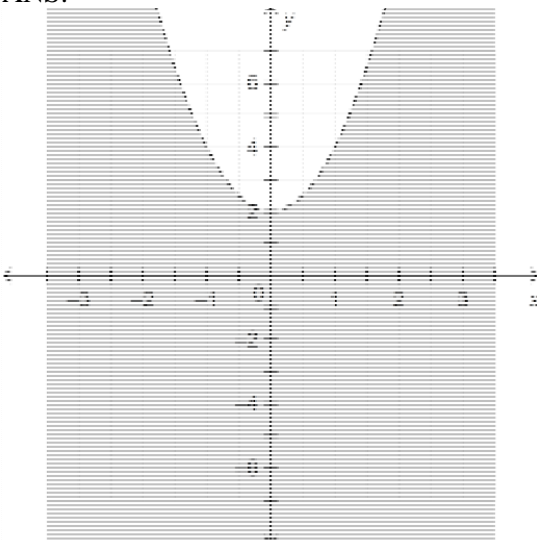
KEY: Procedural Knowledge

20. ANS:



PTS: 0 DIF: Moderate REF: 5.2 Graphing Linear Inequalities in Two Variables
 LOC: 11.RF7 TOP: Relations and Functions
 KEY: Conceptual Understanding | Procedural Knowledge

21. ANS:



PTS: 0 DIF: Moderate REF: 5.3 Graphing Quadratic Inequalities in Two Variables
 LOC: 11.RF7 TOP: Relations and Functions
 KEY: Conceptual Understanding | Procedural Knowledge

22. ANS:

The solutions are: (2, 0) and (0, 4)

PTS: 0 DIF: Moderate REF: 5.5 Solving Systems of Equations Algebraically
 LOC: 11.RF6 TOP: Relations and Functions KEY: Procedural Knowledge

23. ANS:

Two triangles can be constructed.

PTS: 0 DIF: Easy REF: 6.4 The Sine Law

LOC: 11.T3 TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge

24. ANS:

$$\angle W = 34^\circ$$

$$\angle U = 66^\circ$$

$$VW = 6.5 \text{ cm}$$

PTS: 0 DIF: Moderate REF: 6.4 The Sine Law

LOC: 11.T3 TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge

25. ANS:

$$\frac{25 - 9p^2}{36p^2 - 100} = -\frac{1}{4}$$

The non-permissible values are $p = \frac{5}{3}$ and $p = -\frac{5}{3}$.

PTS: 0 DIF: Moderate REF: 7.1 Equivalent Rational Expressions

LOC: 11.AN4 TOP: Algebra and Number

KEY: Conceptual Understanding | Procedural Knowledge

26. ANS:

$$\frac{14}{q+4}, q \neq 2, q \neq -4$$

PTS: 1 DIF: Easy REF: 7.2 Multiplying and Dividing Rational Expressions

LOC: 11.AN5 TOP: Algebra and Number

KEY: Conceptual Understanding | Procedural Knowledge

27. ANS:

$$\frac{(x+2)(x+4)}{4x}, x \neq 0, x \neq 3, x \neq -5$$

PTS: 0 DIF: Moderate

REF: 7.4 Adding and Subtracting Rational Expressions with Binomial and Trinomial Denominators

LOC: 11.AN5 TOP: Algebra and Number

KEY: Conceptual Understanding | Procedural Knowledge

28. ANS:

$$y = \begin{cases} x^2 - 3x - 10, & \text{if } x \leq -2 \text{ or } x \geq 5 \\ -(x^2 - 3x - 10), & \text{if } -2 < x < 5 \end{cases}$$

PTS: 0 DIF: Moderate REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

29. ANS:

The solutions are: $x = 9$, $x = -4$, $x = -3$, and $x = 8$

PTS: 0 DIF: Moderate REF: 8.2 Solving Absolute Value Equations

LOC: 11.RF2 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

PROBLEM

1. ANS:

$$x^2 - 13x - 7 = 0$$

$$x^2 - 13x = 7$$

$$x^2 - 13x + \frac{169}{4} = 7 + \frac{169}{4}$$

$$\left(x - \frac{13}{2}\right)^2 = \frac{197}{4}$$

$$x - \frac{13}{2} = \pm \sqrt{\frac{197}{4}}$$

$$x = \frac{13}{2} \pm \sqrt{\frac{197}{4}}$$

$$x = \frac{13 \pm \sqrt{197}}{2}$$

The roots are: $x = \frac{13 + \sqrt{197}}{2}$ and $x = \frac{13 - \sqrt{197}}{2}$

PTS: 0 DIF: Moderate REF: 3.3 Using Square Roots to Solve Quadratic Equations

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

2. ANS:

Check whether the equation factors.

The value of the discriminant is: $(-1)^2 - 4(2)(-15) = 121$

Since 121 is a perfect square, the equation factors.

Use decomposition to factor.

$$y = 2x^2 - x - 15$$

$$y = (2x + 5)(x - 3)$$

The x -intercepts are: $-\frac{5}{2}$ and 3, or -2.5 and 3

The x -coordinate of the vertex is: $\frac{-2.5 + 3}{2} = 0.25$

Determine the y -coordinate of the vertex.

Substitute $x = 0.25$ in $y = 2x^2 - x - 15$.

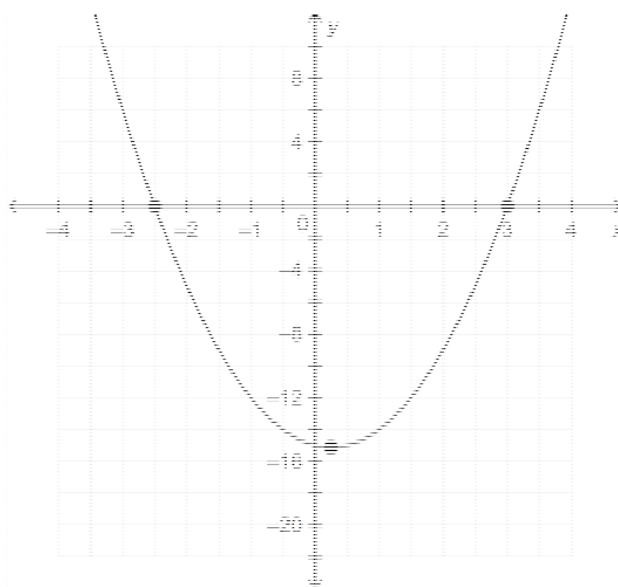
$$y = 2x^2 - x - 15$$

$$y = 2(0.25)^2 - (0.25) - 15$$

$$y = -15.125$$

The coordinates of the vertex are: $(0.25, -15.125)$

On a grid, mark points at the vertex and the intercepts. Draw a smooth curve through the points.



PTS: 0

DIF: Moderate

REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$

LOC: 11.RF4

TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

3. ANS:

a) Determine the distance r from the origin to P.

$$x = -1, y = -5$$

$$r = \sqrt{x^2 + y^2}$$

$$r = \sqrt{(-1)^2 + (-5)^2}$$

$$r = \sqrt{26}$$

$$\cos \theta = \frac{x}{r}$$

$$\cos \theta = \frac{-1}{\sqrt{26}}$$

$$\sin \theta = \frac{y}{r}$$

$$\sin \theta = \frac{-5}{\sqrt{26}}$$

$$\tan \theta = \frac{y}{x}$$

$$\tan \theta = \frac{-5}{-1}, \text{ or } 5$$

b) The reference angle is: $\tan^{-1}(5) = 78.69\dots^\circ$

Since θ is in Quadrant 3, the angle θ is approximately: $180^\circ + 78.69^\circ = 258.69^\circ$

PTS: 0 DIF: Moderate REF: 6.2 Angles in Standard Position in All Quadrants

LOC: 11.T2 TOP: Trigonometry

KEY: Procedural Knowledge | Communication

4. ANS:

$$\text{Use: } b^2 = a^2 + c^2 - 2ac \cos B$$

$$\text{Substitute: } a = 9, b = 10, c = 5$$

$$10^2 = 9^2 + 5^2 - 2(9)(5) \cos B$$

$$\cos B = \frac{9^2 + 5^2 - 10^2}{2(9)(5)}$$

$$\angle B = \cos^{-1} \left(\frac{9^2 + 5^2 - 10^2}{2(9)(5)} \right)$$

$$\angle B = 86.1774\dots$$

$$\angle B \doteq 86^\circ$$

$$\text{Use: } c^2 = a^2 + b^2 - 2ab \cos C$$

$$\text{Substitute: } a = 9, b = 10, c = 5$$

$$5^2 = 9^2 + 10^2 - 2(9)(10) \cos C$$

$$\cos C = \frac{9^2 + 10^2 - 5^2}{2(9)(10)}$$

$$\angle C = \cos^{-1} \left(\frac{9^2 + 10^2 - 5^2}{2(9)(10)} \right)$$

$$\angle C = 29.9264\dots$$

$$\angle C \doteq 30^\circ$$

$$\angle A \doteq 180^\circ - (86.1774\dots^\circ + 29.9264\dots^\circ)$$

$$\angle A \doteq 64^\circ$$

PTS: 1 DIF: Moderate REF: 6.5 The Cosine Law

LOC: 11.T3 TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge

5. ANS:

An equation of the line has the form $y = mx + b$.

Use the points $(0, 0)$ and $(2, 8)$ to determine m and b .

$$m = \frac{8-0}{2-0}$$

$$= 4$$

$$y = 4x + b$$

$$8 = 4(2) + b$$

$$b = 0$$

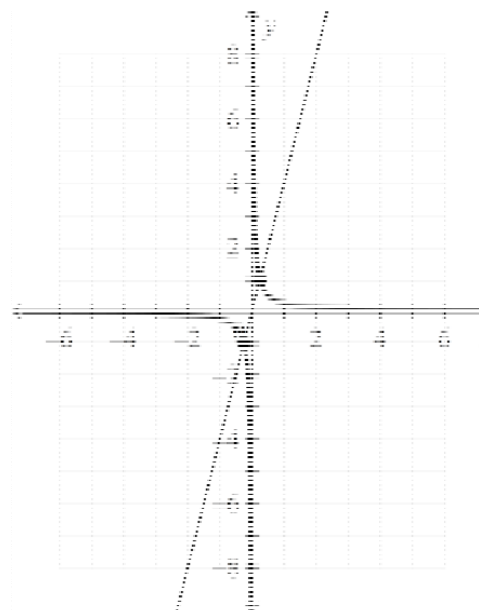
So, an equation of the linear function is $y = 4x$.

For the graph of the reciprocal function:

The equation is: $y = \frac{1}{4x}$

Horizontal asymptote: $y = 0$

x -intercept is 0, so vertical asymptote is $x = 0$.



Mark points at $y = 1$ and $y = -1$ on the graph of $y = 4x$.

Draw a smooth curve through each point so that the curve approaches the asymptotes but never touches them.

PTS: 0

DIF: Difficult

REF: 8.3 Graphing Reciprocals of Linear Functions

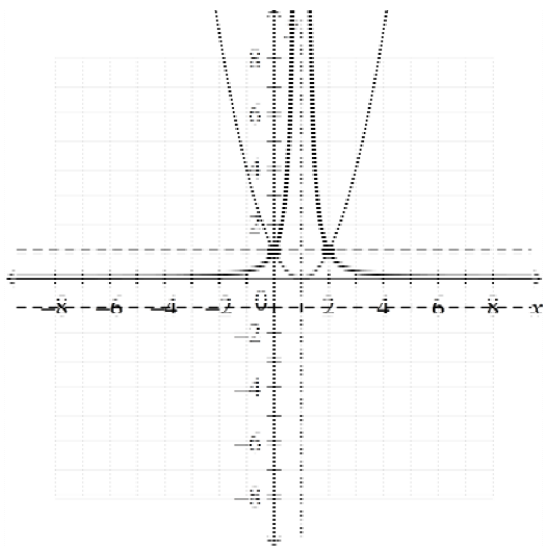
LOC: 11.RF11

TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication

6. ANS:

- a) When the graph of a reciprocal function has one vertical asymptote, the graph of the corresponding quadratic function has one x -intercept. Since the vertical asymptote is $x = 1$, the graph of the quadratic function has vertex $(1, 0)$ and passes through the points $(2, 1)$ and $(0, 1)$. Since the points common to both graphs are above the x -axis, the graph of the quadratic function opens up.



- b) The equation of the quadratic function has the form $y = a(x - h)^2 + k$, where (h, k) is the vertex of the parabola, and a represents its size and direction. Substitute $h = 1$ and $k = 0$.

$$y = a(x - (1))^2 + 0$$

$$y = a(x - 1)^2$$

Use one of the points $(2, 1)$ and $(0, 1)$ to solve for a : $a = 1$

The equation of the quadratic function is: $y = (x - 1)^2$

The equation of the reciprocal function is: $y = \frac{1}{(x - 1)^2}$

PTS: 0 DIF: Difficult REF: 8.5 Graphing Reciprocals of Quadratic Functions

LOC: 11.RF11 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication