

Pre-Calculus 11: Final Review**FORMULAS****Trigonometry**

$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$

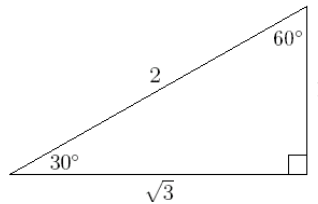
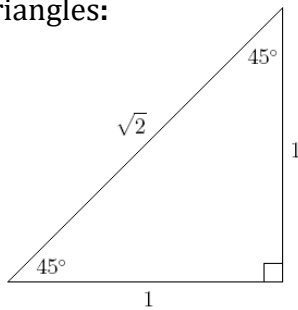
$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{opposite}}{\text{adjacent}}$$

$$\text{Sine Law: } \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\text{Cosine Law: } a^2 = b^2 + c^2 - 2bc \cos A$$

$$\cos A = \frac{a^2 - b^2 - c^2}{2bc}$$

Special Triangles:**Quadratic Functions and Equations**

$$\text{Vertex form: } y = a(x - p)^2 + q$$

$$\text{Standard form: } y = ax^2 + bx + c$$

$$\text{Quadratic formula: } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Unit 1 Final Review – Powers and Factoring

1. Classify as rational Q or irrational \bar{Q} numbers.

(a) -6

(b) 5.3289

(c) $\frac{4}{19}$

(d) $\sqrt{27}$

2. Simplify the following radicals. (**work must be shown**)

(a) $\sqrt{48}$

(b) $\sqrt{75}$

(c) $\sqrt{700x^2y}$

(d) $\sqrt[3]{108}$

3. Evaluate.

(a) $\sqrt[3]{-1000}$

(b) $\sqrt{0.81}$

(c) $\sqrt[6]{64}$

(d) $\sqrt[3]{-\frac{27}{125}}$

4. Write as a radical and evaluate.

(a) $25^{\frac{1}{2}}$

(b) $64^{\frac{1}{2}}$

(c) $27^{\frac{1}{3}}$

(d) $10\,000^{\frac{1}{4}}$

(e) $9^{\frac{3}{2}}$

(f) $(-8)^{\frac{5}{3}}$

(g) $81^{0.25}$

(h) $16^{1.75}$

5. Evaluate.

(a) 3^{-4}

(b) 2^{-1}

(c) $\left(\frac{1}{5}\right)^{-3}$

(d) $\left(\frac{4}{3}\right)^{-2}$

(e) $9^{-\frac{3}{2}}$

(f) $(-8)^{-\frac{5}{3}}$

(g) $-\frac{8}{27}^{-\frac{2}{3}}$

(h) $\frac{9}{16}^{-1.5}$

6. Simplify/evaluate.

$$\text{a) } \left(\frac{9^{\frac{5}{8}}}{9^{\frac{1}{8}} \cdot 9^{\frac{1}{4}}} \right)^8$$

$$\text{b) } \left(\frac{5}{2} a^{-2} b^6 \right)^{-3}$$

$$\text{c) } \frac{18a^6 b^{-9}}{30a^{\frac{1}{2}} b^8}$$

Unit 2 Final Review - Factoring

1. Factor each expression.

a. $14m^2 + 38m$

b. $-6j^2k^3 + 21ijk^4 - 33jk^7$

c. $n^2 + 7n + 8$

g. $(x - 1)^2 - 4$

d. $y^2 + 5y - 36$

h. $w^6 - 3w^3 - 10$

e. $25x^2 - 49y^2$

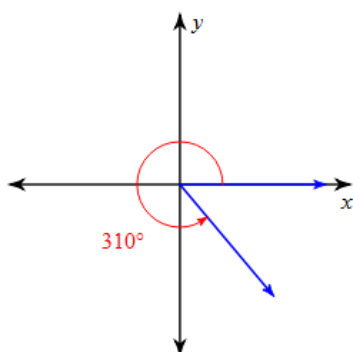
j. $\begin{array}{l} | \\ 50x^2 - 160xy + 128y^2 \end{array}$

f. $0.5x^2 - 3.5x + 5$

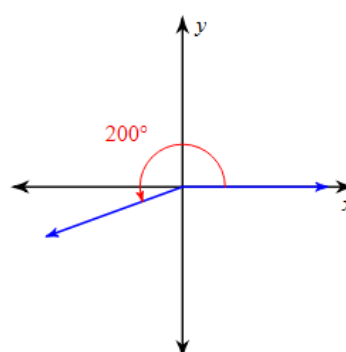
Unit 8 Final Review - Trigonometry

1. Find the reference angle

a)



b)

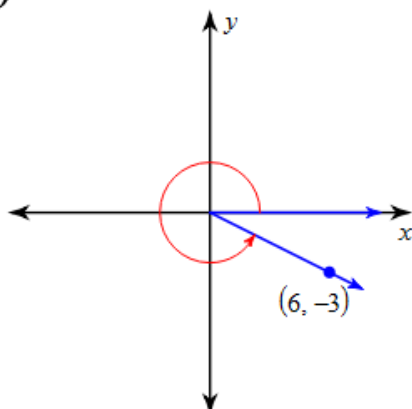


2. What are the three other angles in standard position that have a reference angle of 22 degrees?

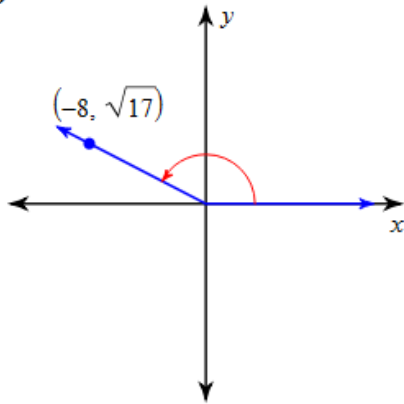
3. Use the given point on the terminal side of angle θ to find the value of the trigonometric function indicated. Diagrams not to scale.

$\sin \theta$

a)



$\cos \theta$



b)

4. Find and show the exact values for the following trigonometric ratios.

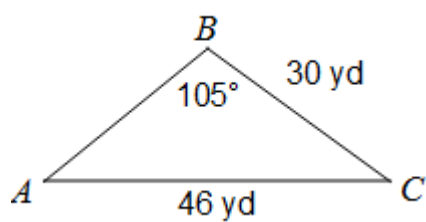
a) $\sin(135^\circ)$

b) $\cos(210^\circ)$

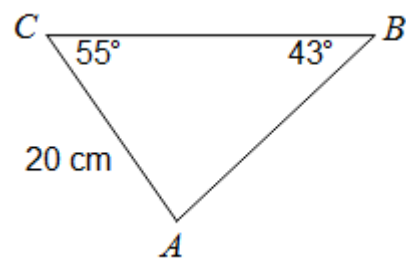
c) $\tan(300^\circ)$

5. Find the missing value using the sine law.

a) Find $\angle A$

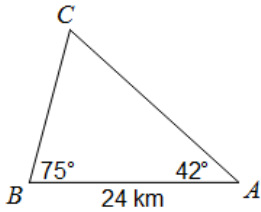


b) Find side AB

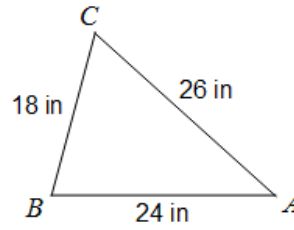


6. Find the missing value using the cosine law.

a) Find AC



b) Find $\angle B$



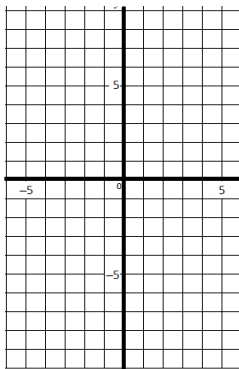
Textbook practice: p 126 #2,4-6,9,10,12,13,16,20,22

Unit 3 Final Review - Quadratic Functions

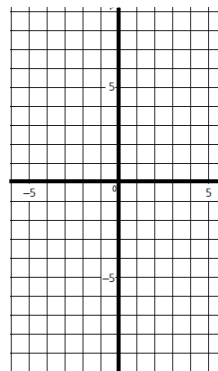
Vertex Form

1. Graph each parabola and state its characteristics.

a) $y = \frac{1}{4}x^2 - 4$



b) $y = -2(x - 1)^2 + 8$



Coordinates of the vertex: _____

Coordinates of the vertex: _____

Equation of the axis of symmetry: _____

Equation of the axis of symmetry: _____

y-intercept: _____

y-intercept: _____

x-intercepts, if any: _____

x-intercepts, if any: _____

Domain: _____

Domain: _____

Range: _____

Range: _____

Maximum or minimum value: _____

Maximum or minimum value: _____

2. Write an equation for a parabola vertex at $(-3, 5)$ passing through the point $(2, -45)$.

3. Determine the vertex of each quadratic function.

a) $y = x^2 - 4x - 12$

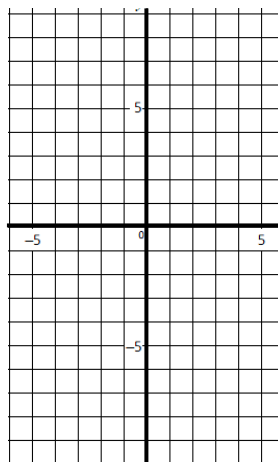
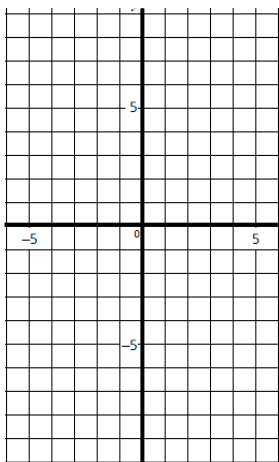
b) $y = -2x^2 - 8x - 5$

Standard Form

4. Graph each of the following by completing the square.

a) $y = x^2 - 8x + 14$

b) $y = -2x^2 + 12x - 20$



Quadratic Problems

5. A theatre company has 300 season ticket subscribers. The theatre has decided to raise the price of a season ticket from its current price of \$400. A survey of the subscribers has determined that for every \$20 increase in price, 10 subscribers would not renew their seasons tickets.

(a) What is the maximum revenue the theatre will generate?

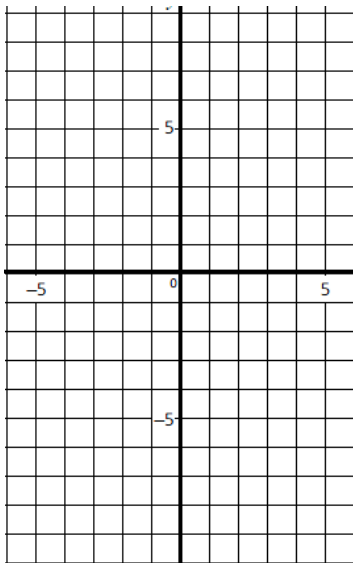
(b) What ticket price will maximize revenue?

Textbook practice: p 198 #2,4,5,9,12,17

Unit 4 Final Review - Quadratic Equations

Solving Quadratic Equations

1. Solve $x^2 + 2x - 3 = 0$ by **graphing**.



Root(s): $x =$ _____

2. Solve by **factoring**.

a) $x^2 + 3x - 28 = 0$

b) $4x^2 - 3x = 0$

c) $2x^2 = 27 - 15x$

d) $2x^2 + 5x = 3$

e) $16x^2 - 49 = 0$

f) $12x^2 - 27 = 0$

3. Solve by **taking the square root**.

a) $5x^2 - 67 = 18$

b) $(x - 2)^2 = 81$

c) $25x^2 + 4 = 23$

4. Solve using the **quadratic formula**. State your answers as both **exact** and **approximate to two decimal places**.

a) $2x^2 + x - 4 = 0$

b) $10x^2 - 7x - 1 = 0$

5. Find the **discriminant** and the **nature of the roots** for the following quadratic equations.
(Hint: use $b^2 - 4ac$)

a) $2x^2 - 4x = -2$

b) $-3x^2 = x + 9$

6. The area of a board is 270 cm^2 , and the length is 17 cm greater than the width. Build a quadratic equation and solve it to find the dimensions of the board.

7. A springboard diver's height, in metres, above the water, is given by the equation $h(t) = -5t^2 + 8t + 4$, where h is the height in metres, and t is the time in seconds. When does the diver hit the water?

Textbook practice: p 258 #1,5,6,7,9,11,13-15,18,19

Unit 5 Final Review – Radical Expression and Equations

Radical Expressions

1. Simplify by writing as a mixed radical.

(a) $\sqrt{32r^3}$

(b) $5\sqrt[3]{81x^6y^6}$

(c) $8\sqrt{72x^5y^{12}}$

2. Add or subtract.

(a) $-\sqrt{5} + 3\sqrt{12} - 2\sqrt{20}$

(b) $\sqrt[3]{108} - 3\sqrt[3]{4} - 3\sqrt[3]{32}$

(c) $5\sqrt{5} - 4\sqrt{12} - (2\sqrt{45} + 6\sqrt{3})$

3. Multiply. Simplify your answers where possible.

(a) $-\sqrt{2p^3} \cdot \sqrt{20p}$

(b) $-4\sqrt{15}(\sqrt{6} + 2\sqrt{10})$

(c) $(2 + \sqrt{5})(3 - \sqrt{5})$

4. Divide. Rationalize the denominator when necessary and simplify your answer.

(a) $\frac{2\sqrt{90}}{3\sqrt{18}}$

(b) $-\frac{3}{\sqrt{3}}$

(c) $\frac{\sqrt{2m^3n}}{\sqrt{10m^2n^2}}$

(d) $\frac{\sqrt{3}}{4\sqrt{3}+\sqrt{2}}$

Radical Equations

5. Solve each equation. Remember to check for extraneous solutions!

(a) $\sqrt{2x} - 3 = 5$

(b) $\sqrt{n-10} = \sqrt{32-2n}$

(c) $10 + \sqrt{20-2x} = x$

Unit 6 Final Review - Rational Expressions and Equations

Rational Expressions

1. Simplify. Identify the non-permissible values.

$$(a) \frac{1-t}{t^2-1}$$

$$(b) \frac{3x-6}{2x^2+x-10}$$

2. Multiply or divide and simplify completely. Identify the non-permissible values.

$$(a) \frac{25ab^2}{4b} \cdot \frac{10b^3}{5a}$$

$$(b) \frac{b^2+4b+3}{3-b} \div \frac{b^2+2b+1}{b^2-9}$$

3. Add or subtract and simplify completely. Identify the non-permissible values.

$$(a) \frac{3x+7}{x+2} - \frac{2x+3}{x+2}$$

$$(b) \frac{6}{x^3} + \frac{5}{2x^4}$$

$$(c) \frac{2x}{x^2-6x+5} - \frac{3}{x^2-5x}$$

Rational Equations

4. Solve each equation. Remember to check for extraneous solutions!

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

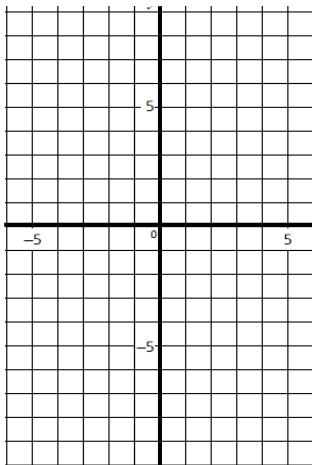
$$(b) \frac{2p}{p-1} + \frac{p-5}{p^2-1} = 1$$

$$(c) \frac{6}{x+3} + \frac{5}{x-1} = \frac{8}{x-1}$$

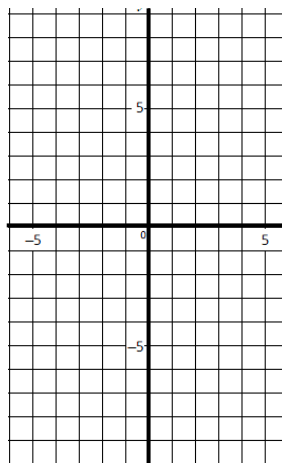
Unit 7 (Chapter 9) Final Review -Linear/Quadratic Inequalities Inequalities

3. Graph the following inequalities.

(a) $y < x^2 + 2x$



(b) $4y - 12x \geq 8$



4. Solve the following inequalities.

(a) $x^2 - 6x - 16 > 0$

(b) $2x^2 - 7x - 4 \geq 0$

(c) $2x^2 + 7x + 3 < 0$

(d) $x^2 + 5x - 14 \leq 0$

ANSWERS

Bonus Ch. 1 Final Review

1. (a) rational (b) rational (c) rational (d) irrational

2. Simplify the following radicals. (Calculators are permitted but work must be shown)

(a) $\sqrt{48} = 4\sqrt{3}$ (b) $\sqrt{75} = 5\sqrt{3}$ (c) $\sqrt{700x^2y} = 10x\sqrt{7y}$ (d) $\sqrt[3]{108} = 3\sqrt[3]{4}$

3. Evaluate.

(b) $\sqrt[3]{-1000} = -10$ (b) $\sqrt{0.81} = 0.9$ (c) $\sqrt[6]{64} = 2$ (d) $\sqrt[3]{-\frac{27}{125}} = -\frac{3}{5}$

4. Write as a radical and evaluate.

(b) $25^{\frac{1}{2}} = 5$ (b) $64^{\frac{1}{2}} = 8$ (c) $27^{\frac{1}{3}} = 3$ (d) $10\,000^{\frac{1}{4}} = 10$

(e) $9^{\frac{3}{2}} = 27$ (f) $(-8)^{\frac{5}{3}} = -32$ (g) $81^{0.25} = 3$ (h) $16^{1.75} = 128$

5. Evaluate.

(b) $3^{-4} = \frac{1}{81}$ (b) $2^{-1} = \frac{1}{2}$ (c) $\left(\frac{1}{5}\right)^{-3} = 125$ (d) $\left(\frac{4}{3}\right)^{-2} = \frac{9}{16}$

(e) $9^{-\frac{3}{2}} = \frac{1}{27}$ (f) $(-8)^{-\frac{5}{3}} = -\frac{1}{32}$ (g) $-\frac{8}{27}^{-\frac{2}{3}} = -\frac{9}{4}$ (h) $\frac{9}{64}^{-1.5} = \frac{64}{27}$

6. a) 81

b) $\frac{8a^6}{125b^{18}}$

c) $\frac{3a^{\frac{11}{2}}}{5b^{17}}$

Unit 2 Final Review

1. a) $2m(7m+19)$

b) $-3jk^3(2j-7ik+11k^4)$

c) not possible

d) $(y+9)(y-4)$

e) $(5x+7y)(5x-7y)$ f) $0.5(x-2)(x-5)$

g) $(x+1)(x-3)$

h) $(w^3-5)(w^3+2)$

i) $2(4q+6t-1)(4q-6t+17)$ j) $2(5x-8y)^2$

Unit 8 Final Review

1. a) 50^0 b) 40^0

2. $158^0, 202^0, 338^0$

3 a) $\frac{-\sqrt{5}}{5}$ b) $-8/9$

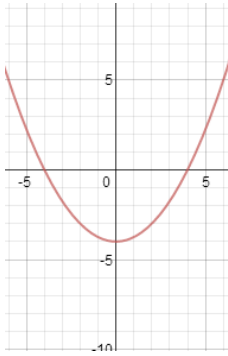
4. a) $\frac{1}{\sqrt{2}}$ b) $\frac{-\sqrt{3}}{2}$ c) $-\sqrt{3}$

5. a) 39^0 b) 24 cm

6. a) 26 ft b) 75^0

Unit 3 Final Review

1. a)

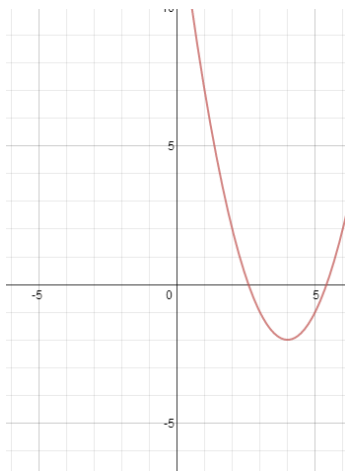


vertex: $(0, -4)$
 axis of symm: $x = 0$
 y-int: -4
 x-int: -4 and 4
 domain: $\{x|x \in R\}$
 range: $\{y|y \geq -4, y \in R\}$
 max or min: -4 (min)

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

3. a) $(2, -16)$

4. a)



5. a) 125000 b) 500

Unit 4 Final Review

1. $x = 1$ and -3

2. a) $4, -7$ b) $0, \frac{3}{4}$ c) $-9, \frac{3}{2}$ d) $-3, \frac{1}{2}$

3. a) $\pm\sqrt{17}$ b) $-7, 11$ c) $\pm\frac{\sqrt{19}}{5}$

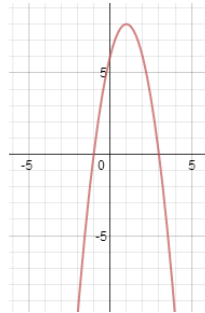
4. a) exact: $\frac{-1 \pm \sqrt{33}}{4}$; approx: -1.69 and 1.19

5. a) 0 ; one distinct real root

6. 27 cm by 10 cm

7. 2 seconds after diving

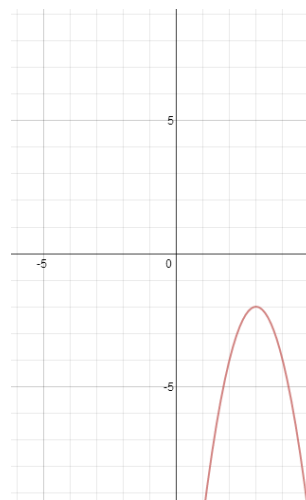
a)



Vertex: $(1, 8)$
 Axis of symm: $x = 1$
 y-int: 6
 x-int: -1 and 3
 domain: $\{x|x \in R\}$
 range: $\{y|y \leq 8, y \in R\}$
 max or min: 8 (max)

$(-2, 3)$

b)



Unit 5 Final Review

1. (a) $4r\sqrt{2r}$ (b) $15x^2y^2\sqrt[3]{3}$ (c) $48x^2y^6\sqrt{2x}$
 2. (a) $-5\sqrt{5} + 6\sqrt{3}$ (b) $-6\sqrt[3]{4}$ (c) $-1\sqrt{5} - 14\sqrt{3}$

b) exact: $\frac{7 \pm \sqrt{89}}{20}$; approx: $-0.12, 0.82$

b) -107 ; no real roots

3. (a) $-2p^2\sqrt{10}$ (b) $-12\sqrt{10} - 40\sqrt{6}$ (c) $1 + \sqrt{5}$
 4. (a) $\frac{2\sqrt{5}}{3}$ (b) $-\sqrt{3}$ (c) $\frac{\sqrt{5mn}}{5n}$ (d) $\frac{12-\sqrt{6}}{46}$
 5. (a) 32 (b) 14 (c) 10 (8 is extraneous)

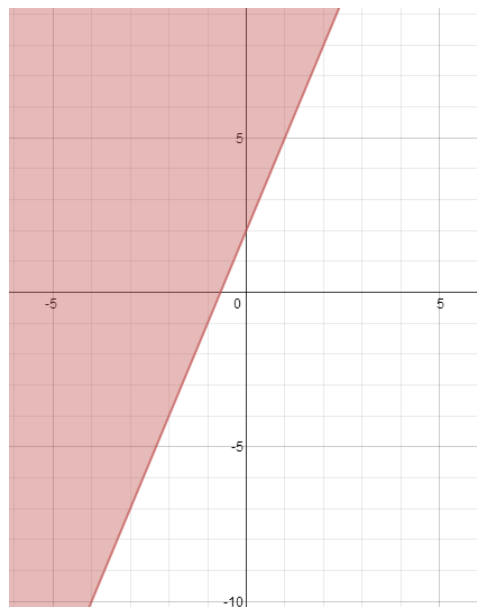
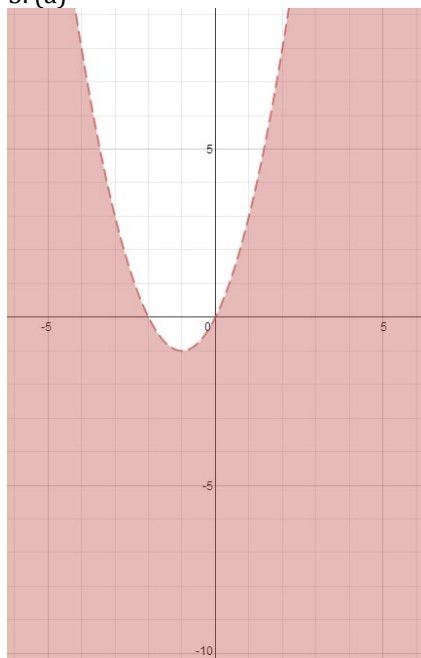
Unit 6 Final Review

1. (a) $\frac{-1}{t+1}; t \neq \pm 1$ (b) $\frac{3}{2x+5}; x \neq 2, -\frac{5}{2}$
 2. (a) $\frac{25b^4}{2}; a \neq 0, b \neq 0$ (b) $-\frac{(b+3)^2}{b+1}; b \neq -3, -1, 3$
 3. (a) $\frac{x+4}{x+2}; x \neq -2$ (b) $\frac{12x+5}{2x^4}; x \neq 0$ (c) $\frac{2x^2-3x+3}{x(x-5)(x-1)}; x \neq 0, 1, 5$
 4. (a) $x = 3$ (b) $p = -4$ (c) $x = 5$

(b)

Unit 7 Final Review

3. (a)



4. (a) $x < -2$ or $x > 8$ (b) $x \leq -\frac{1}{2}$ or $x \geq 4$ (c) $-3 < x < -\frac{1}{2}$ (d) $-7 \leq x \leq 2$