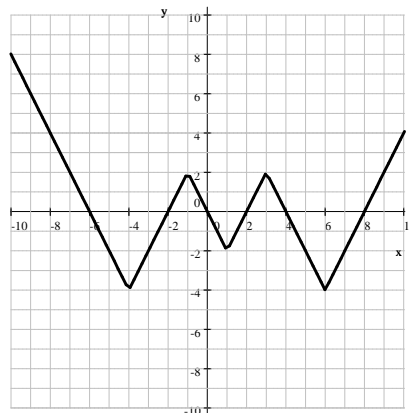


Please note that Quiz 6 will also cover topics covered on Quizzes 1-5. Please review those topics as well, even if they do not appear on this document.

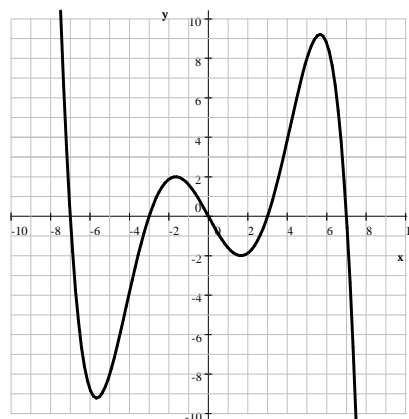
1. Find the set of all values of  $x$  for which  $P(x, y)$  is on the graph shown below and

- a)  $y < 0$   
 b)  $y \leq -6$   
 c)  $y \geq 2$



2. Find the set of all values of  $x$  for which  $P(x, y)$  is on the graph shown below and

- a)  $y \geq 0$   
 b)  $y < 0$



3. What is the smallest value of the expression  $x^2 - 20x + 85$ ?

4. Solve the equation  $\frac{x}{2} - \frac{x+1}{5} = \frac{x}{3} + 1$ . Make sure to check your solution.

5. Factor completely (over  $\mathbb{R}$ ) by completing the square or state if the expression can not be factored.

- a)  $12x - 2x^2 - 16$       c)  $12x - 2x^2 - 4$       e)  $6x^2 - x - 15$   
 b)  $12x - 2x^2 - 20$       d)  $12x - 2x^2 - 32$       f)  $x^2 + x - 1$

6. a) Solve the equation  $9x^2 - 12x = 1$ .      b) Check your solution using exact values.

7. Simplify each of the following. Write all answers with positive exponents.

- a)  $-2^{-2}$       e)  $\left(\frac{a}{b}\right)^{-2}$       h)  $\left(\frac{x^{-5}}{y^4}\right)^{-3}$       k)  $\left(\frac{(-2x^2y^3)(-3x^{-1}y^6)}{-2xy}\right)^0$   
 b)  $(-2)^{-2}$       f)  $\frac{a}{b^{-2}}$       i)  $2^{-1} - 3^{-1}$       l)  $\left(\frac{a^2b^{-1}}{a^{-3}b^2}\right)^{-2}$   
 c)  $\left(\frac{1}{2}\right)^{-3}$       g)  $\left(\frac{p}{q^{-3}}\right)^{-2}$       j)  $\frac{(-2x^3y^{-2})^{-2}(-x^{-2}y)^5}{(-2x^2y^{-1})^{-5}(y^3x^{-4})^2}$       m)  $\frac{a^2 - b^{-1}}{a^{-3} + b^2}$   
 d)  $\frac{1}{\left(\frac{1}{3}\right)^{-2}}$

8. The hypotenuse of a right triangle is 58 cm. The difference between the other two sides is 2 cm. Find the sides of the triangle.

9. An arch is in the shape of a semicircle. At a point along the base 2 feet from an end of the arch, the height of the arch is 10 feet. Find the maximum height of the arch.
10. Find the distance between  $(7, -2)$  and  $(3, 3)$ .
11. Compute the exact value of the area of the triangle with sides 10 cm, 10 cm, and 8 cm long.
12. Compute the exact value of the area of an equilateral triangle with sides 12 meters.
13. We have 100 coins in a jar, all dimes and nickels. How many dimes do we have if the total value of all coins is \$6.90?
14. We invested \$5000 in two accounts. One account earns a 7% interest rate, the other earns 13%. How much money was invested in each account if after one year, the combined interest from the two accounts was \$542?
15. Completely factor each of the following over the real numbers.
- |                           |                              |                     |                      |
|---------------------------|------------------------------|---------------------|----------------------|
| a) $80x^3 + 30x^4 - 5x^5$ | c) $\frac{1}{2}x^2 - 4x + 8$ | e) $-48x - 3x^3$    | h) $4x^2 - 24x + 40$ |
| b) $x^3 - 4x$             | d) $2x^8 - 32x^4$            | f) $6x^2 - 13x - 5$ | i) $12x - x^2 - 29$  |
|                           |                              | g) $12x^4 - 4x^3$   | j) $3x^2 - 6x + 78$  |
16. Find the exact value of the height of a square-based pyramid if we know that all of its edges are 12 meters long.
17. Simplify each of the following.
- |                                        |                        |                                             |                                           |
|----------------------------------------|------------------------|---------------------------------------------|-------------------------------------------|
| a) $(3\sqrt{7} - 2)(\sqrt{7} + 1)$     | c) $(3\sqrt{2} - 1)^2$ | e) $\frac{24 - \sqrt{40}}{2}$               | g) $2\sqrt{80} - 5\sqrt{45} + \sqrt{500}$ |
| b) $\frac{3 - \sqrt{5}}{\sqrt{5} - 1}$ | d) $(3\sqrt{2} - 1)^3$ | f) $\frac{\sqrt{12} - \sqrt{75}}{\sqrt{3}}$ | h) $\frac{11}{3\sqrt{5} - 1}$             |
- i) Find the exact value of  $-a^2 - 5a + 8$  if  $a = 3\sqrt{5} - 1$
18. Rationalize the denominator in  $\frac{\sqrt{5} + \sqrt{2}}{\sqrt{5} - \sqrt{2}}$
19. Prove that the repeating decimal  $3.0302302302\dots$  is rational by re-writing it as a fraction of two integers.
20. Graph the parabola  $y = x^2 - 8x + 7$ . Clearly state the coordinates of five points, including vertex and intercepts.
21. Find all real numbers that are exactly 1 greater than their own reciprocal.
22. Find the exact value of the longest line segment that can be drawn inside the rectangular prism with sides 5 cm, 8 cm, and 10 cm long.

## Answers

1. See handout Graphical Solutions

- a)  $(-6, -2) \cup (0, 2) \cup (4, 8)$   
 b) there is no such  $x$   
 c)  $(-\infty, -7] \cup \{-1, 3\} \cup [9, \infty)$   
 or  $[-10, -7] \cup \{-1, 3\} \cup [9, 10]$

2. See handout Graphical Solutions

- a)  $(-\infty, -7] \cup [-3, 0] \cup [3, 7]$   
 b)  $(-7, -3) \cup (0, 3) \cup (7, \infty)$

3.  $-15$  (when  $x = 10$ )4. See handout Review of Equations  $-36$ 

5. See handouts Completing the Square parts 1, 2, 3, 4.

- a)  $-2(x-2)(x-4)$  b) cannot be factored  
 c)  $-2(x-3+\sqrt{7})(x-3-\sqrt{7})$   
 d) cannot be factored  
 e)  $6\left(x-\frac{5}{3}\right)\left(x+\frac{3}{2}\right)$  or  $(3x-5)(2x+3)$   
 f)  $\left(x+\frac{1-\sqrt{5}}{2}\right)\left(x+\frac{1+\sqrt{5}}{2}\right)$

6. See handout Completing the Square - part 4

a)  $\frac{2 \pm \sqrt{5}}{3}$

b) If  $x = \frac{2 + \sqrt{5}}{3}$ , then

$$\begin{aligned} \text{LHS} &= 9\left(\frac{2 + \sqrt{5}}{3}\right)^2 - 12\left(\frac{2 + \sqrt{5}}{3}\right) \\ &= 9\frac{(2 + \sqrt{5})^2}{3^2} - 4(2 + \sqrt{5}) \\ &= (2 + \sqrt{5})^2 - 4(2 + \sqrt{5}) \\ &= 4 + 5 + 4\sqrt{5} - 8 - 4\sqrt{5} = 1 = \text{RHS} \end{aligned}$$

and if  $x = \frac{2 - \sqrt{5}}{3}$ , then

$$\begin{aligned} \text{LHS} &= 9\left(\frac{2 - \sqrt{5}}{3}\right)^2 - 12\left(\frac{2 - \sqrt{5}}{3}\right) \\ &= 9\frac{(2 - \sqrt{5})^2}{3^2} - 4(2 - \sqrt{5}) \\ &= (2 - \sqrt{5})^2 - 4(2 - \sqrt{5}) \\ &= 4 + 5 - 4\sqrt{5} - 8 + 4\sqrt{5} = 1 = \text{RHS} \end{aligned}$$

7. See handouts Exponents 1 and Integer Exponents

- a)  $-\frac{1}{4}$  b)  $\frac{1}{4}$  c) 8 d)  $\frac{1}{9}$  e)  $\frac{b^2}{a^2}$   
 f)  $ab^2$  g)  $\frac{1}{p^2q^6}$  h)  $x^{15}y^{12}$  i)  $\frac{1}{6}$   
 j)  $\frac{8x^2}{y^2}$  k) 1 l)  $\frac{b^6}{a^{10}}$  m)  $\frac{a^5b - a^3}{b + a^3b^3}$

For problems 8-12, see handout Pythagorean Theorem

8. 40 cm and 42 cm 9. 26 feet 10.  $\sqrt{41}$  units11.  $A = 8\sqrt{21}$  cm<sup>2</sup> 12.  $36\sqrt{3}$  m<sup>2</sup>

13. See handout Systems of Equations. 38

14. See handouts Linear Word Problems and Systems of Equations

\$1800 at 7% and \$3200 at 13%

15. See handouts on Factoring A, Factoring 1, and Completing the Square Parts 1, 2, 3, 4

a)  $-5x^3(x+2)(x-8)$  b)  $x(x-2)(x+2)$

c)  $\frac{1}{2}(x-4)^2$  d)  $2x^4(x^2+4)(x+2)(x-2)$

e)  $-3x(x^2+16)$  f)  $6\left(x-\frac{5}{2}\right)\left(x+\frac{1}{3}\right)$

g)  $4x^3(3x-1)$  h)  $4(x^2-6x+10)$

i)  $-(x-6+\sqrt{7})(x-6-\sqrt{7})$  j)  $3(x^2-2x+26)$

16. See handout Pythagorean Theorem

$\sqrt{72} = 6\sqrt{2}$  m

17. See handout Radical Expressions

a)  $19 + \sqrt{7}$  b)  $\frac{\sqrt{5}-1}{2}$  c)  $19 - 6\sqrt{2}$

d)  $-55 + 63\sqrt{2}$  e)  $12 - \sqrt{10}$  f)  $-3$

g)  $3\sqrt{5}$  h)  $\frac{3\sqrt{5}+1}{4}$  i)  $-33 - 9\sqrt{5}$

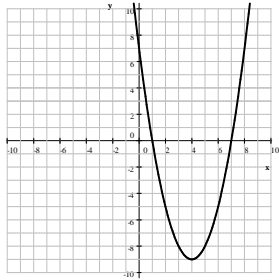
18. See handout Radical Expressions  $\frac{7 + 2\sqrt{10}}{3}$ 19. See handout Fractions and Decimals  $3\frac{302}{9990} = \frac{30272}{9990}$

20. See handout Graphing Parabolas.

Vertex:  $(4, -9)$ ,  $y$ -intercept:  $(0, 7)$ ,

$x$ -intercepts:  $(1, 0)$  and  $(7, 0)$

Additional points:  $(2, -5)$ ,  $(3, -8)$ ,  $(5, -8)$ ,  $(6, -5)$



21.  $\frac{1 + \sqrt{5}}{2}$  and  $\frac{1 - \sqrt{5}}{2}$

22. See handout Pythagorean Theorem  
 $\sqrt{189} \text{ cm} = 3\sqrt{21} \text{ cm}$

Last revised: September 14, 2017