# Algebra 2 First Semester Final Review-I

1. Solve these equations for all solutions of each. YOU NEED TO SHOW YOUR WORK. (3 points each)

a) $x^{1/3} = 4$

b) $(2x + 5)^2 - 4(2x + 5) = 5$

c) $\frac{10}{x} - \frac{12}{x-3} + 4 = 0$

d) $3x^3 - 5x^2 - 12x + 20 = 0$

2. In this problem $c$ is a constant whose value you must determine. For the equation, $2x^2 + 3x + c = 0$ (1 point each)

a) Give one value of $c$ so the equation has real solutions

b) Give one value of $c$ so the equation has complex solutions

c) **HONORS**: Give one value of $c$ so the equation has 1 solution (really the same solution twice)

3. Solve these inequalities. Write your solution using any valid mathematical notation (3 points each)

a) $2(x + 6) \geq -3(x + 5)$

b) $4 + |2x - 3| < 9$

c) $(x - 6)(4x + 1)(2x - 3) < 0$

d) **HONORS** $\frac{x}{x+1} \leq 3x$

4. Simplify the following completely. Show your work. (2 points each)

a) $(3 - \sqrt{12})(4\sqrt{2} + \sqrt{6})$

b) $i^{21} + 3i^{14}$

c) $\frac{3}{4 + 7i}$

d) $\left(\frac{x^{3/2} y^{-1/2}}{x^{-1/2} z^{3/5}}\right)^{-2}$

5. For the circle, $(x - 6)^2 + (y + 4)^2 = 36$

a) (1 point) Find the center.

b) (1 point) Find the radius.

c) (2 points) Give 4 points on the circle.

**d)** **HONORS** (1 point) Give one more point on the circle.

6. Give the equations of the following shapes in any form you wish. (2 points each)

a) any horizontal line.

b) A line with $x$-intercept 8 and $y$-intercept $-3$.

c) A line perpendicular to $11x - 2y = 18$ that passes through $(-8, 5)$.

7. Hooke's Law states that if a weight $w$ is attached to a hanging spring, then the total length of the spring $s$ is related to weight by the function $L = 0.3w + 2.5$ where $w$ is in lbs and $L$ is in inches.

a) (1 point) What does the slope represent in this problem?

b) (1 point) What does the $y$-intercept represent in this problem?

c) (2 points) Find $L$ for $w = 3$ and explain its meaning using correct units.

d) (2 points) Find $w$ when $L = 10$ and explain its meaning using correct units.

8. Solve the following using your graphing calculator. Give answers correct to 2 decimal places. (2 points each)

a) $x^3 - 3x^2 + x + 1 = 0$

b) $x^3 - 3x^2 + x + 1 < 0$

9. Harry J Blige wants to make 300 mL of a 50% acid solution to clean his shoes. He has some 60% acid solution and some 30% acid solution on hand. How much of each should he mix to get the desired result? (4 points)

10. EXTRA CREDIT: (1 point, all or nothing) Give an inequality with a solution of $(-3, -1) \cup (4, \infty)$.

**Answers**

1. a) $4^3 = 64$ b) $x = 0\ ;\ x = -3$ c) $x = 5\ ;\ x = -\frac{3}{2}$ d) $x = \pm 2,\ \frac{5}{3}$

2. a) $c < \frac{9}{8}$ b) $c > \frac{9}{8}$ c) $c = \frac{9}{8}$

3. a) $x \geq -\frac{27}{5}$ b) $-1 < x < 4$ c) $x < -\frac{1}{4},\ \frac{3}{2} < x < 6$
   d) $-1 < x \leq -\frac{2}{3}$ or $x \geq 0$

4. a) $6\sqrt{2} - 5\sqrt{6}$ b) $i - 3$ c) $\frac{12 - 21i}{65}$ d) $\frac{yz^{6/5}}{x^4}$

5. a) $C\,(6, -4)$ b) $r = 6$ c) $(12, -4), (0, -4), (6, -10), (6, 2)$
   d) $(6 \pm a\ ,\ -4 \pm b)$ where $a^2 + b^2 = 36$

6. a) $y =$ any real numbers b) $\frac{3}{8} = \frac{y}{x-8}$ or $\frac{3}{8} = \frac{y+3}{x}$ or $3x - 8y - 24 = 0$ or $y = \frac{3}{8}x - 3$
   c) $\frac{-2}{11} = \frac{y-5}{x+8}$ or $2x + 11y - 39 = 0$ or $y = -\frac{2}{11}x + \frac{39}{11}$

7. a) slope = the rate the length of the spring increases in inches per pounds of weight attached.
   b) $y$-intercept represents the starting length of the spring with no weight attached.
   c) $L = 3.4$ in.
   d) $w = 25$ lbs.

8. a) $x = -0.41, x = 1, x = 2.41$ b) $x < -0.41$ or $1 < x < 2.41$

9. 200 mL of 60% acid solution and 100 mL of 30% acid solution

10. $(x + 3)(x + 1)(x - 4) > 0$