

KEY

### ALG 2 Cumulative Review #2: 2012 Fall Final

You will need to use your own paper to work the following problems.

1. Use the parent graph  $f(x) = x^2$  to complete each of the following for  $g(x) = -2(x+6)^2 + 5$

- a) What are the coordinates of the vertex?  $(-6, 5)$
- b) Is  $g(x)$  a reflection of  $f(x)$  over the x-axis, the y-axis, or neither? X-axis
- c) What is the domain written in interval notation?  $(-\infty, \infty)$
- d) What is the range written in inequality notation?  $y \leq 5$
- e) What is the range written in interval notation?  $[-\infty, 5]$
- f) Write  $g(x)$  in standard form.  $-2x^2 - 24x - 67$
- g) What is the degree of  $g(x)$ ? 2
- h) What is the leading coefficient of  $g(x)$ ? -2
- i) What translation right or left does  $g(x)$  have in comparison to  $f(x)$ ? left 6
- j) What translation up or down does  $g(x)$  have in comparison to  $f(x)$ ? up 5
- k) What is the y-intercept? -67
- l) Find the y-coordinate for the point where  $x = 1$ . -93
- m) Does  $g(x)$  open up or down and how can you tell? down  $a = -2$  look at sign
- n) In comparison with  $f(x)$  does  $g(x)$  have a vertical stretching, a vertical compression, or neither? compression
- o) Create a new function, call it  $h(x)$ , by moving  $g(x)$  down 3 units and 2 units to the right.  $-2(x+4)^2 + 2$
- p) Does  $g(x)$  have a maximum or a minimum and what is its value? max,  $(-6, 5)$  or 5
- q) Approximate the x-intercepts of  $g(x)$  to the tenths place. -7.6, -4.4
- r) What is the equation of the axis (line) of symmetry?  $x = -6$

2. Solve by finding all roots by using the calculator to find as many rational roots as possible, then use synthetic division and the quadratic formula to find the remaining roots. Show all work!

$x^4 - 5x^3 - 2x^2 - 20x - 24 = 0$

From Graph  $(x = -1)$   $(x = 6)$

-1	1	-5	-2	-20	-24
		-1	-6	-4	24
	1	-6	-4	-24	0

6	1	-6	-4	-24
		6	0	24
	1	0	-4	0

$x^2 + 4 = 0$   
 $x = \pm \sqrt{-4}$   
 $x = \pm 2i$

3. Create a polynomial function that has x-intercepts of -8, 1, and  $\sqrt{2}$

$(x+8)(x-1)(x-\sqrt{2})(x+\sqrt{2}) = x^4 + 7x^3 - 10x^2 - 14x + 16$

4. Solve the equation by any means. Simplify the answers.

a.  $x^2 - 8x = -15$

$x = 3$   $x = 5$

b.  $2x^2 + 1 = 17$

$\pm 2\sqrt{2}$

5. Rewrite the equation in vertex form.

$y = x^2 - 6x - 2$

$(h, k)$

$y = (x-3)^2 - 11$

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6. Perform the indicated operation and write your answer in standard form.

a.  $(2x^3 - 7x - 14) \div (x - 4)$

$$2x^2 + 8x + 26 + \frac{86}{x-4}$$

b.  $(x-5)(3x^2+2x-3)$

$$3x^3 - 13x^2 - 13x + 15$$

c.  $2xy(x^2+6y)$

$$2x^3y + 12xy^2$$

d.  $(9x^3+12x+6) - (x^3-4x^2+5)$

$$8x^3 + 4x^2 + 12x + 1$$

7. Let  $f(x) = 4x^3 - 5x^2 + 3$ . Complete each of the following.

a. Use synthetic division to divide  $f(x)$  by  $x + 1$ .

$$\begin{array}{r|rrrr} -1 & 4 & -5 & 0 & 3 \\ & & -4 & 9 & -9 \\ \hline & 4 & -9 & 9 & -6 \end{array} \quad 4x^2 - 9x + 9 + \frac{-6}{x+1}$$

b. Using your answer from above determine if  $x + 1$  is a factor of  $f(x)$ . You must explain your answer to receive credit.

NO - remainder was  $-6$  not zero

c. Use synthetic substitution, not direct substitution, to find  $f(-1)$ .

see (a)  $f(-1) = -6$

8. Factor each of the following. Write "prime" if the problem will not factor at all.

a.  $27x^3 + 8y^3$

$$(3x+2y)(9x^2-6xy+4y^2)$$

b.  $x^3 - 64y^3$

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

c.  $5x^2 + x + 7$

prime

d.  $14x^3y + 21x^3y^2 + 7x^2y$

$$7x^2y(2x+3xy+1)$$

e.  $9x^2 - 1$

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

f.  $18x^2 + 5x - 2$

$$(2x+1)(9x-2)$$

g.  $4x^2 - 3x - 10$

$$(x-2)(4x+5)$$

h.  $28x^3 - 12x^2 - 7x + 3$

$$(2x-1)(2x+1)(7x-3)$$

9. Solve each equation with imaginary solutions.

a.  $x^2 + 25 = 0$

$$\pm 5i$$

b.  $25x^2 + 49 = 0$

$$\pm \frac{7}{5}i$$

c.  $\frac{1}{2}x^2 = -25$

$$\pm 5\sqrt{2}i$$

10. Express each number in terms of  $i$ .

a.  $\sqrt{-150}$

$$5i\sqrt{6}$$

b.  $\frac{1}{2}\sqrt{-256}$

$$8i$$

11. Write the conjugate of  $15 - 8i$

$$15 + 8i$$

12. Write the conjugate of  $-9i$

$$9i$$

13. Find the zeros of  $f(x) = x^2 + 6x - 27$

$$x = -9 \quad x = 3$$

14. Solve using the quadratic formula  $x^2 - 2x - 14 = 0$

$$\begin{array}{l} a=1 \\ b=-2 \\ c=-14 \end{array}$$

$$1 \pm \sqrt{15}$$

15. Solve using the quadratic formula

$$\begin{array}{l} x^2 + 9 = x \\ a=1 \quad b=-1 \quad c=9 \end{array}$$

$$\frac{1}{2} \pm \frac{\sqrt{15}}{2}i$$

16. Find the value of the discriminant for the equation  $x^2 - 5x = -3$

$$a=1 \quad b=-5 \quad c=3$$

$$13$$

$$b^2 - 4ac$$

17. Find the value of the discriminant for the equation  $x^2 + 12 = 4x$

$$a=1 \quad b=-4 \quad c=12$$

$$-32$$

18. Find the value of the discriminant for the equation  $x^2 - 6x + 9 = 0$

$$a=1 \quad b=-6 \quad c=9$$

$$0$$

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In problems 19-21, match the value of the discriminant with the nature of the roots from A, B, and C.

B 19. -15

A. 1 distinct real solution

A 20. 0

B. 2 imaginary solutions

C 21. 14

C. 2 real solutions

22. Graph the quadratic inequality:  $f(x) > x^2 - 2x - 8$

$(-2, 0)$   $(-1, -5)$   $(0, -8)$   $(1, -9)$   $(2, -8)$

Plot the points with the given x-coordinates: -2, -1, 0, 1, & 2 on the graph.

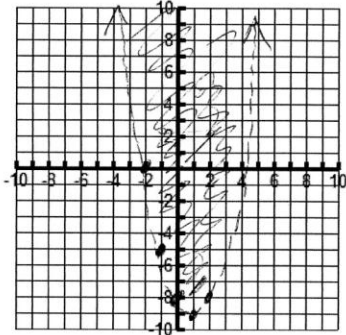
Find the vertex  $(1, -9)$  x-intercepts  $-2$  &  $4$  y-intercept  $-8$

Use the axis of symmetry to plot the points on the right side of the vertex.

$x=1$

Is the boundary line solid or dashed?

Don't forget to shade correctly.



23. Solve the inequality.  $x^2 - 11x + 13 \leq 25$

$-1 \leq x \leq 12$

24. Subtract the following  $(9-i) - (-9-6i) =$

$18 + 5i$

25. Multiply.  $3(4+12i) =$

$12 + 36i$

26. Multiply  $(1+5i)(9-5i) =$

$34 + 40i$

Given the parent function and a description of the transformation, write the equation of the transformed function,  $f(x)$ .

27. Absolute value - vertical shift up 2, horizontal shift right 1.

$|x-1|+2$

28. Rational - vertical shift down 5

$\frac{1}{x}-5$

29. Cubic - flipped over the x axis, vertical shift down 2

$-(x)^3 - 2$

30. Exponential ( $y = 2^x$ ) - vertical stretch by 8

$2^{8x}$

31. Quadratic - vertical stretch by 5, horizontal shift left 8.

$5(x+8)^2$

32. Which graph best represents the function  $f(x) = 2x^2 - 2$ ?

