College Algebra **TEST 3 Solution** **Spring 2014**

NAME: _____Score_____/100

Please print

SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION Course Average_____

No Decimals, mixed numbers, complex fractions, boxed or circled answers. Use function notation. Show work. If you use a formula – state the formula, then use it.

Questions 1 – 30 are 1 pt each all others are 5 pts each

1. T **F** Every function has an inverse.
2. **T** F Every term is a polynomial.
3. T **F** All quadratic functions have inverses.
4. **T** F If a 7^{th} degree polynomial is divided by a 4^{th} degree polynomial, the quotient will be a 3^{rd} degree polynomial.
5. **T** F The graph of an odd degree polynomial function must have at least one x-intercept..
6. **T** F All linear functions have inverses.
7. T **F** Every polynomial is a term.
8. **T** F The composition of two functions is a function.
9. T **F** Every trinomial polynomial is a quadratic polynomial.
10. T **F** A polynomial is a letter, a number, or a product of letters and numbers.
11. **T** F A term is a letter, a number, or a product of letters and numbers.
12. **T** F A linear function is a polynomial function.
13. **T** F $(x + 2)^2 + (y - 7)^2 = 15$ is the equation of a circle.
14. **T** F A circle is the set of points in a plane that are equidistant from a fixed point called the center.
15. T **F** The graph of an even degree polynomial function must have at least one x-intercept.
16. If a zero of a polynomial has **odd** multiplicity, then the graph crosses the x-axis at that zero.
17. The numerical part of a term is called the **coefficient** of the term.
18. The distance d between two points (x_1, y_1) and (x_2, y_2) is given by the formula:

    $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$.
19. A function f has an inverse if it passes the **horizontal** line test.
20. If the leading coefficient of a fifth degree polynomial function is –7 then as $x \to -\infty, f(x) \to +\infty$
21. If $\frac{p}{q}$ is a rational zero of a polynomial function f then **q** is a divisor of the leading coefficient .
22. If $f \circ g(x) = x$ and $g \circ f(x) = x$ then f and g are **inverses**
23. If x – 5 is a factor of a polynomial function, then **(5, 0)** is an x-intercept of the graph of f .
24. If $\frac{p}{q}$ is a rational zero of a polynomial function f then **p** is a divisor of the constant term.

25. The graph of a polynomial function is a **smooth continuous** curve with no **sharp** corners.

26. The graph of a function f is the set of points of the form $(a, f(a))$.

27. The inverse of a function is the inverse with respect to **composition.**

28. If f is a polynomial function whose rule is $f(x) = -3x^5 + 3x^4 - 5x - 34$ then

As $x \to +\infty$, $f(x) \to -\infty$

As $x \to -\infty$, $f(x) \to +\infty$

29. Which of the following are the rules for polynomial functions

a. $f(x) = 3x + 5$

b. $f(x) = 3x^2$

c. $f(x) = 3x^2 - 5x + 12x^{-1}$

d. $f(x) = \frac{3}{4}x^5 - 2x^3 + \sqrt{5}x - \frac{8}{\sqrt{3}}$

e. $f(x) = \frac{x^2 + 2x - 5}{x}$

f. $f(x) = x^7 - 5$

g. $f(x) = (x - 2)^4(x + 6)$

30. Consider $(x - 3)^2 + (y + 1)^2 = 9$

a. the graph of the equation is a parabola

b. the graph of the equation is a circle

c. the vertex of the parabola is (3, –1)

d. the center of the circle is (–3, 1)

e. the center of the circle is (3, 1)

f. the center of the circle is (–3, –1)

g. the radius of the circle is 9.

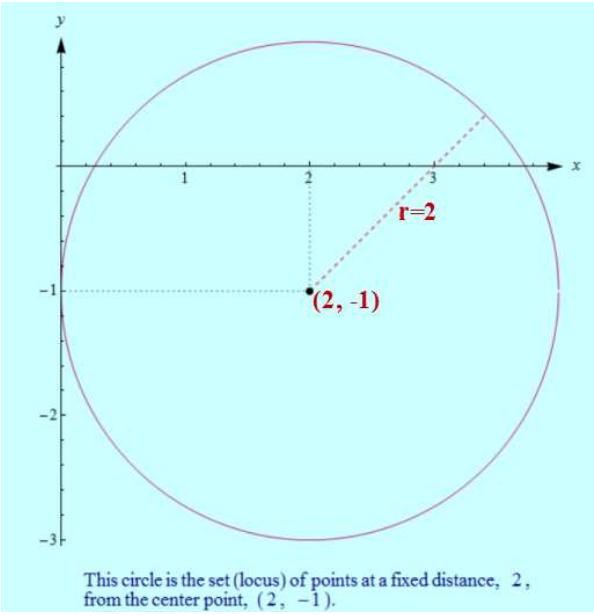
h. the radius of the circle is 3

i. the radius of the circle is 81

31. What number must be added to $x^2 + 3x$ to make it a perfect square?

$\left(\frac{3}{2}\right)^2 = \frac{9}{4}$

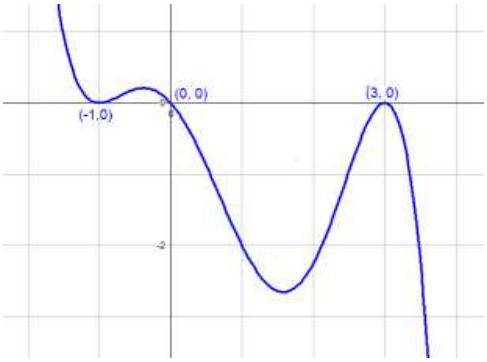
32. Sketch the graph of $(x - 2)^2 + (y + 1)^2 = 4$.



33. An analysis of a function f reveals the following facts:

a. f is a polynomial function of degree 5.
b. The real zeros of f are –1, 0, and 3.
c. The multiplicity of –1 is 2.
d. The multiplicity of 3 is 2.
e. As $x \to +\infty$, $f(x) \to -\infty$
   As $x \to -\infty$, $f(x) \to +\infty$

Sketch the graph of f.



34. What are the possible rational zeros of $f(x) = 4x^5 + 8x^3 + 4x - 3$.

$$p \in \{\pm 1, \pm 3\}$$

$$q \in \{\pm 1, \pm 2, \pm 4\}$$

$$\frac{p}{q} \in \left\{\pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}, \pm 3, \pm \frac{3}{2}. \pm \frac{3}{4}\right\}$$

35. Find the length of the line segment joining (3, –5) and (–2, 4).

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} = \sqrt{(3+2)^2 + (-5-4)^2} = \sqrt{5^2 + 9^2} = \sqrt{25+81} = \sqrt{106}$$

36. Find the midpoint of the line segment joining (3, –5) and (–2, 4) .

The midpoint is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{3-2}{2}, \frac{-5+4}{2}\right) = \left(\frac{1}{2}, -\frac{1}{2}\right)$

An ordered pair contains the coordinates of one point in the coordinate system. A point is named by its ordered pair of the form of (x, y). The first number corresponds to the x-coordinate and the second to the y-coordinate.

The midpoint of a line segment is a point in the coordinate system containing the line segment. Therefore it is named by a pair of real numbers written in the form (x, y).

Important notes: (x, y) is not equal to (y, x).
{x, y} is an unordered set and is different than (x, y)
{x, y} = {y, x}
x, y is just a list it is neither a set nor an ordered pair.

It is not permissible to introduce, drop, and then reintroduce the parenthesis in a willy-nilly fashion in your presentation.

37. Find the rule for the inverse of the function whose rule is f(x) = 3x + 5

$y = 3x + 5$

$x = 3y + 5$

$x - 5 = 3y$

$y = \frac{x - 5}{3}$

$f^{-1}(x) = \frac{x}{3} - \frac{5}{3}$

38. Use Completing the Square to write this General Form $x^2 + y^2 - 4x - 6y + 8 = 0$ of the equation of a circle in Standard Form. What is the center of the circle and what is its radius?

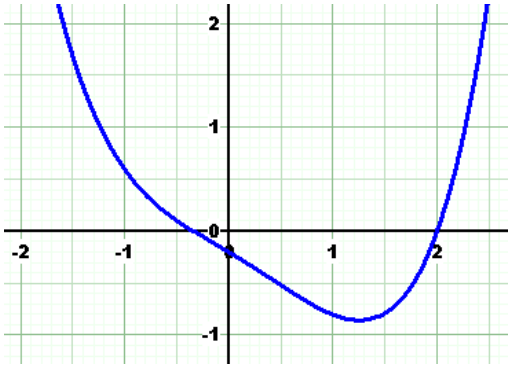
$x^2 + y^2 - 4x - 6y + 8 = 0$
$(x^2 - 4x \quad) + (y^2 - 6y \quad) = -8$
$(x^2 - 4x + 4) + (y^2 - 6y + 9) = -8 + 4 + 9 = 5$
$(x - 2)^2 + (y - 3)^2 = 5$
The center of the circle is (2, 3) and the radius is $\sqrt{5}$

39. possible rational zeros of the function whose rule is $f(x) = 3x^4 - 2x^3 - x^2 - 12x - 4$ are calculated to be

$\frac{p}{q} \in \left\{\pm 1, \pm\frac{1}{3}, \pm 2, \pm\frac{2}{3}, \pm 4, \pm\frac{4}{3}\right\}$

A computer generated graph of f is shown at the right.
Use that graph to determine which of the possible rational zeros are reasonable guesses that should be tested. DO NOT TEST THEM.

The set of reasonable choices is $\left\{-\frac{1}{3}, 2\right\}$



40. Answer the following questions and then sketch the graph of the function whose rule is $f(x) = (x-2)^2(x+2)(x-1)$. **Label all important points.**

a. What kind of function is f?

f is a polynomial function.

b. What is its degree?

The degree of f is 4.

c. What is the leading term?

The leading term of f is x^4.

d. Describe the end behavior.

As $x \to +\infty, f(x) \to +\infty$

As $x \to -\infty, f(x) \to +\infty$

e. What are the real zeros and their multiplicities?

2 is a zero of multiplicity 2.

– 2 is a zero of multiplicity 1.

1 is a zero of multiplicity 1.

41. Suppose f is a polynomial function f whose leading term is $-3x^5$ and whose constant term is 5. Which of the following are true?

a. The graph of f tries to cross the x-axis 5 times.

b. The graph of f has at least one x-intercept.

c. The graph of f might have no x-intercepts.

d. As $x \to +\infty, f(x) \to +\infty$.

e. As $x \to -\infty, f(x) \to +\infty$.

f. As $x \to +\infty, f(x) \to -\infty$.

g. As $x \to -\infty, f(x) \to -\infty$

h. A possible rational zero of f is $\frac{3}{5}$.

i. A possible rational zero of f is $\frac{5}{3}$.