College Algebra TEST 2 Chapter 2 Summer 2005

NAME: _____Score_____/100
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SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION

Circle T or F, whichever is correct. (1 point each)

1. **T** F 3y + 1 = 4x - 7 is the equation of a line.

2. T **F** If the slope of one line is $\frac{1}{3}$ and the slope of another line is 3, the lines are perpendicular

3. **T** F If a vertical line may be drawn so that it intersects a graph in more than one point, then that graph is not the graph of a function.

4. T **F** If a vertical line may be drawn so that it intersects the graph of a function f in more than one point, then the function f does not have an inverse.

5. **T** F The product of two functions f and g is a function.

6. **T** F If g is a function, then g(5) is the unique range element associated with the domain element 5 by the function g.

7. T **F** A zero of a function is in the range of the function.

8. T **F** The range of a function is the set of all real numbers for which the rule makes sense.

9. **T** F The vertex of the function f whose rule is f(x) = | x – 2 | is at (2, 0)

10. T F Two functions f and g are inverses of each other if $f \circ g(x) = x$ **and** $g \circ f(x) = x$

11. T **F** A function and an equation are the same thing.

12. **T** F Composition of functions is not commutative.

13. **T** F If f and g are functions and f is the inverse of g, then g is the inverse of f.

14. **T** F The graph of a quadratic function is a parabola which opens up if its leading coefficient is positive.

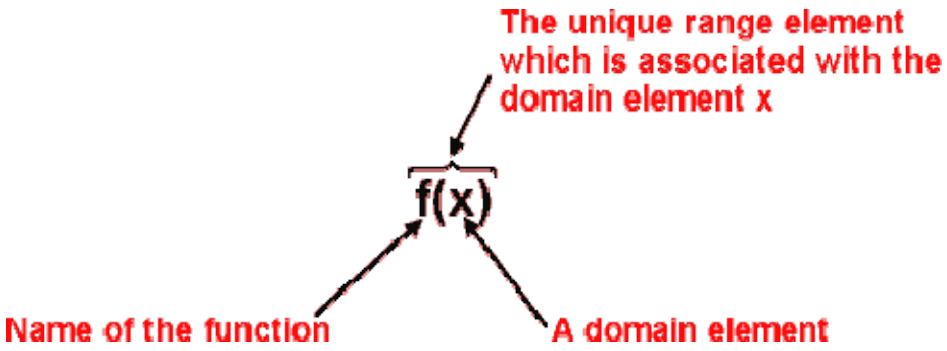
15. T **F** A quadratic function has an inverse.

Fill in the blanks

16. **Definition:** A function consists of three things;

- A set called the **domain**
- A set called the **range**
- A **rule** which associates **each** element of the **domain** with a **unique** element of the range.

17. Fill in the blanks



18. A linear equation in two variables is an equation which may be written in the form **$y = mx + b$** where m, and b are real numbers.

19. The slope of the non-vertical line through two points (x_1, y_1) and (x_2, y_2) is $m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{y_2 - y_1}{x_2 - x_1}$

20. The distance between two points (x_1, y_1) and (x_2, y_2) is $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

21. The midpoint of the line segment joining two points (x_1, y_1) and (x_2, y_2) is the point $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

22. Two non-vertical lines are **perpendicular** if and only if their slopes are negative reciprocals of each other.

23. If the slope m and one point (x_1, y_1) on a line are known then the point-slope form for the equation of that line is **$y - y_1 = m(x - x_1)$**

24. If a line has slope m and y-intercept b, then its equation in slope-intercept form is **$y = mx + b$**

25. The graph of a function is the set of all points whose coordinates are (a, **f(a)**) where a is an element of the domain and **f(a)** is the **corresponding range** element.
26. A zero of a function f is a **domain** element d for which **f(d) = 0**.
27. The identity function is the function I which has the property that **I(x) = x** for all x in the domain of I.
28. The sum of two functions f and g is a function h with the property that **h(x) = f(x) + g(x)** for all x in the common domain of f and g.
29. The product of two functions f and g is a function h such that **h(x) =** $(f(x))(g(x))$ for all x in the common domain of f and g.
30. A linear function is a function whose rule may be written in the form **f(x) = mx + b** where m and b are real numbers.
31. A quadratic function is a function whose rule may be written in the form **f(x) = $ax^2 + bx + c$** where a, b, and c are real numbers and a is not 0.
32. The square root function is the function f whose rule may be written in the form $f(x) = \sqrt{x}$
33. The composition of a function f with a function g is a function named $f \circ g$ whose rule is $f \circ g(x) = f(g(x))$
34. Let f be a function with domain A and range B. Then the inverse of the function, if it exists, is a function named f^{-1}, with domain B and range A with the property that $f \circ f^{-1}(x) = x$ **and** $f^{-1} \circ f(x) = x$
35. The absolute value function is a function whose rule may be written in the form **f(x) = |x|**
36. The domain of the function f with rule f(x) = $\sqrt{x-5}$ is $\{x \mid x \geq 5\} = [5, \infty)$
37. If the point (3, 7) is on the graph of a function named h, then h(3) = **7**
38. The rule for the linear function f whose graph has slope 3 and y-intercept 5 is **f(x) = 3x + 5**
39. The reciprocal function is a function whose rule may be written in the form $f(x) = \frac{1}{x}$
40. Two non-vertical lines are **parallel** if and only if they have different y-intercepts and the same slopes.

41. Write the equation, in slope intercept form, of the line with slope 5 which passes through the point (1, 3)

Solution: Use the point-slope equation. $y - y_1 = m(x - x_1)$

$y - 3 = 5(x - 1)$

$y = 5x - 2$

42. Find the slope of the line through the points (1, 3) and (-3, 8)

$$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{8-3}{-3-1} = \frac{5}{-4}$$

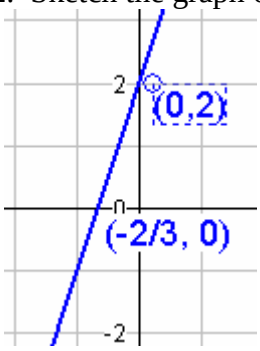
43. Find the distance between the points (1, 3) and (-3, 8)

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} = \sqrt{(-3-1)^2 + (8-3)^2} = \sqrt{16+25} = \sqrt{41}$$

44. Suppose f is a function whose rule is $f(x) = 2x^2 - 5$. Calculate f(3).

$f(3) = 2(3^2) - 5 = 2(9) - 5 = 13$

45. Suppose f is a function whose rule is f(x) = 3x + 2. Sketch the graph of f.



46. Suppose f is a function whose rule is f(x) = (x – 3)(x + 2)(x – 5). Find the zeros of f.

Solution: To find the zeros of the function we must solve the equation resulting from **f(x) = 0**

Thefore we solve (x – 3)(x + 2)(x – 5) = 0

Use of the zero factor property produces the zeros 3, -2, and 5

47. Suppose f and g are functions whose rules may be written as $f(x) = 3x^2 + 1$ and g(x) = x – 2. Find the rule for the sum (f + g). Write the rule correctly as a rule.

$(f + g)(x) = f(x) + g(x) = (3x^2 + 1) + (x - 2) = 3x^2 + x - 1$

48. Suppose f and g are functions whose rules may be written as $f(x) = 3x^2 + 1$ and g(x) = x – 2. Find the rule for the product (f g). Write the rule correctly as a rule.

$$(fg)(x) = (f(x))(g(x)) = (3x^2 + 1)(x - 2) = 3x^3 - 6x^2 + x - 2$$

49. Suppose f and g are functions whose rules may be written as $f(x) = 3x^2 + 1$ and g(x) = x – 2. Find the rule for the composition $f \circ g$. Write the rule correctly as a rule.

$$f \circ g(x) = f(g(x)) = f(x-2) = 3(x-2)^2 + 1 = 3(x^2 - 4x + 4) + 1 = 3x^2 - 12x + 13$$

50. Suppose f is the function whose rule is $f(x) = 3x^2 + 1$. Verify that the point (2, 13) is on the graph of f

(2, 13) is on the graph of f if and only if f(2) = 13. So we compute: $f(2) = 3(2^2) + 1 = 13$

Therefore the point (2, 13) is on the graph of f.

51. Suppose f is the function whose rule is f(x) = 2x – 9. Find its inverse f^{-1}

$y = 2x - 9$

$x = 2y - 9$

$y = (x + 9)/2$

$$f^{-1}(x) = \frac{x+9}{2}$$

52. Suppose f and g are functions whose rules are f(x) = 7x + 1 and g(x) = $\frac{x-1}{7}$.

Show the f and g are inverses of each other.

We must show that

$f \circ g(x) = x$ **and** $g \circ f(x) = x$.

So we compute

$$f \circ g(x) = f\left(g(x)\right) = f\left(\frac{x-1}{7}\right) = 7\left(\frac{x-1}{7}\right)+1 = x$$

$$g \circ f(x) = g\left(f(x)\right) = g\left(7x+1\right) = \frac{(7x+1)-1}{7} = x$$