**Practice TEST #2**

(1) Find the slope and the y-intercept for the following linear functions:
   (a) $3x - y = 6$;
   (b) $2x - 3y = 6$;
   (c) $2x + 5y = 10$;
   (d) $4x - 3y = 9$

(2) Write the equation of the line through the given point and having the indicated slope:
   (a) Through (-4,3), m=.75;
   (b) Through (2,4), m=-1;
   (c) Through (-5,4), m=-1.5;
   (d) Through (6,1), m=0

(3) Write the equation of the line through the given points:
   (a) Through (-4,3) and (2,5);
   (b) Through (-7,4) and (6,-2);
   (c) Through (5,7) and (13,1);
   (d) Through (-6,-10) and (6,5)

(4) Find the equation of the line satisfying the given conditions, giving it in slope-intercept form , if possible:
   (a) Through (-1,4) and parallel to $x + 3y = 5$;
   (b) Through (1,6) and perpendicular to $3x + 5y = 1$;
   (c) Through (-5,7) and perpendicular to $y = -2$;
   (d) Through (-5,8) and parallel to $y = -.2x + 6$;
   (e) Through the origin and perpendicular to $2x + y = 6$

(5) For the following functions do: (1) Give the domain and the range; (2) Give the coordinates of the vertex; (3) Give the interval over which the function is increasing; (4) State whether the vertex is a maximum or minimum point, and give the corresponding maximum or minimum value of the function; (5) Tell whether the graph is concave up or concave down.
   (a) $f(x) = (x + 4)^2$;
   (b) $f(x) = (x - 5)^2 - 4$;
   (c) $f(x) = -2(x + 3)^2 + 2$;
   (d) $f(x) = .75(x - 2)^2 - 1$;
   (e) $f(x) = -2x^2 + 6x$;
   (f) $f(x) = 4x^2 - 4x$;
   (g) $f(x) = 4x^2 - 2x - 15$;
   (h) $f(x) = 6x^2 - 16x - 6$

(6) Find the equation of the quadratic function satisfying the given conditions:
   (a) Vertex (-1,-4); through (5,104);
   (b) Vertex (8,3); through (10,5);
   (c) Vertex (-4,-2); through (2,-26);
   (d) Vertex (-4,3); through (2,5);
   (e) Vertex (5,6); through (1,-6);

(7) A farmer wishes to enclose a rectangular region. He has 120 feet of fencing, and plan to use one side of his barn as a part of the enclosure. Let $x$ represent the length of one of the parallel sides of the fencing, and respond to each of the following:
   (a) Determine a function A that represents the area of the region in terms of $x$;
   (b) For this particular problem, what are the restrictions on $x$?
   (c) What is the maximum area the farmer can enclose? determine the answer analytically, and support it graphically.

(8) A piece of machinery is capable of producing rectangular sheets of metal satisfying the condition that the length is three times the width. Furthermore, equal size squares measuring 5 inches on a side can be cut from the corners so that the resulting piece of metal can be shaped into an open box by folding up the flaps.
   (a) Determine a function V that express the volume of the box in terms of the with $x$ of the original sheet of metal;
   (b) What restrictions must be placed on $x$ in this particular problem?
   (c) If specifications call for the volume of such box to be 1435 cubic inches, what should the dimensions of the original piece of metal be? Solve analytically and support it graphically.

(9) Which of the following equations has(have) no real solutions:

(1) $x^2 + 1 = 0$ (2) $-(x-4)^2 + 3 = 0$ (3) $2x^2 + 6x + 8 = 0$

(A) All of them (B) only 2 and 3 (C) only 1 and 2 (D) only 1 and 3 (E) None of them.

(10) If $f(x) = x^2 + 2nx + n^2$ then the vertex is:

(A) $(n, n^2)$ (B) $(2n, n^2)$ (C) $(0, n)$ (D) $((0, -n)$ (E) $(-n, 0)$.

(11) Consider the following function:

(1)
$$f(x) = \begin{cases} x + 2, & \text{if } -4 \leq x < 2 \\ x^2, & \text{if } 2 \leq x \leq 3 \\ -3x + 18, & \text{if } 3 < x \leq 6 \end{cases}$$

(A) Find $f(2)$, $f(5)$, $f(10)$.

(B) Graph the function.

(C) What are the domain and the range of the function?

(12) American River College has plans to construct a rectangular parking lot on land bordered on one side by a highway. There are 640 feet of fencing available to fence the other three sides. What dimensions will give a maximum area, and what will this area be?

(13) Consider the function $f(x) = -(x+3)^2 - 5$. Give the interval(s) over which the function:

(A) is continuous; (B) increases; (C) decreases; (D) is constant.

(14) Find the equation for a quadratic function that fits the data exactly.

| x | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| y | 7 | 1 | -1 | 1 | 7 |

(15) Suppose that x represents one of two positive numbers whose sum is 45. For what two such numbers is the product equal to 504?

(16) A farmer wishes to enclose a rectangular region boarding a river with fencing. She has 600 feet of fencing available. What dimensions for the total enclosed region would give an area of 22,500 square feet?

(17) Find the equation for a quadratic function that fits the data exactly.

| x | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|
| y | 4 | -2 | -4 | -2 | 4 |

(18) Consider the function $f(x) = -3(x+4)^2 - 8$. Give the interval(s) over which the function:

(A) is continuous; (B) increases; (C) decreases; (D) is constant.

(19) Suppose that x represents one of two positive numbers whose sum is 30. Determine the two such numbers whose product is maximum, and what is this maximum.

(20) Consider the following function:

(2) $$f(x) = \begin{cases} -x+2, & \text{if } -4 \le x < 2 \\ x^2 - 4, & \text{if } 2 \le x \le 3 \\ x+2, & \text{if } 3 < x \le 6 \end{cases}$$

(A) Find $f(2)$, $f(5)$, $f(10)$.

(B) Graph the function.

(C) What are the domain and the range of the function?

(21) Which of the following lines is NOT perpendicular to the line $y = x + 5$
(A) $y = 4 - x$ (B) $y + x = -5$ (C) $20x + 2y - 20 = 0$
(D) $-x = y - 1$ (E) $-y = x + \frac{1}{5}$.

(22) Decide if the following statements are true or false:

(A) The graph of $x = 5y + 6$ has x-intercept 6.

(B) The graph of $2y - 8 = 3x$ has y-intercept 4.

(C) The lines $3x + 4y = 12$ and $4x + 3y = 12$ are perpendicular.

(D) Slope is not define for horizontal lines.

(23) Consider the function $f(x) = \dfrac{3x-5}{x^2 - x - 6}$.
(a) Find the domain of the function and express it in interval notation.

(b) Find the zeros of the function.

(24) (a) Find k so that the line containing the points (-3,k) and (4,8) is parallel to the line containing the points (5,3) and (1,6).

(b) Write the equation of the line passing through the point (2,1) and perpendicular to $4x - 2y = 3$.

(25) The width of a rectangle is with 26 inches smaller than the length. If the width is tripled and the length is doubled, the perimeter of the new rectangle would be 124 inches. What are the width and the length of the original rectangle?

(26) Let $f(x) = \sqrt{x+1}$, $g(x) = \dfrac{1}{x}$ , and $h(x) = x + 3$ . Find an equation defining each function and state the domain.

a)$f + g$ b) $f - g$ c)$fg$ d) $\dfrac{f}{g}$ e) $f \circ g \circ h$

(27) Let $f(x) = (1,2),(2,3),(3,4),(4,5)$, $g(x) = (1,2),(2,3),(3,4),(4,5)$ , and $h(x) = (1,0),(2,1),(3,2)$ . Find an equation defining each function and state the domain.

a)$f+g$ b) $f-g$ c)$fg$ d) $\dfrac{f}{g}$ e) $f \circ g \circ h$

(28) Find two possible decompositions of $h(x) = \dfrac{1}{(x^3+x+1)^2}$

(29) Find one decomposition of $h(x) = (x-3)^3 + 2(x-3)^2 + 1$

(30) Find two possible decompositions of $h(x) = \sqrt{\dfrac{1}{x}}$

(31) Find one decomposition of $h(x) = \dfrac{2}{x^3} + \dfrac{3}{x^2} - \dfrac{1}{x}$

(32) Find two possible decompositions of $h(x) = \sqrt{x^2+1}$

(33) Find one decomposition of $h(x) = \dfrac{x+2}{(x+2)^2+1}$