

# MATH 110, Spring 2008, Practice TEST #1

(1) Multiple choice problems:

(a) What is the domain of the function :  $f(x) = \frac{5}{\sqrt{x-5}}$

- (A)  $[5, +\infty)$     (B)  $(-\infty, 5]$     (C)  $(5, +\infty)$     (D)  $(-\infty, 5)$     (E) all real numbers.

(b) Identify the equations that determine  $y$  as a function of  $x$ :

- (1)  $x^2 + y^2 = 1$     (2)  $3x + 5y = 0$     (3)  $y = \sqrt[3]{2x-7}$

- (A) only 2    (B) only 2 and 3    (C) only 1 and 2    (D) only 3    (E) all of them.

(c) If  $(4, -9)$  is a point on the graph of  $f(x)$ , which of the following points MUST be on the graph of  $y = \frac{1}{3}f(x+1)$

- (A)  $\left(\frac{4}{3}, -8\right)$     (B)  $\left(\frac{4}{3}, -10\right)$     (C)  $(3, -3)$     (D)  $(5, -3)$     (E)  $\left(\frac{4}{3}, -3\right)$ .

(d) What is the domain of the function  $f(x) = \frac{2x+3}{1-x^2}$ ?

- (A)  $(-\infty, -1) \cup (1, +\infty)$     (B)  $(-\infty, -1] \cup [1, +\infty)$     (C)  $(-1, 1)$   
(D) all real numbers    (E) all real numbers except -1 and 1.

(e) Which function(s) has(have)  $-3$  as a zero?

- (1)  $f(x) = 2x + 6$     (2)  $f(x) = x^2 + 2x - 15$     (3)  $f(x) = \frac{x^2 + 2x - 15}{2x + 6}$

- (A) only (1)    (B) all of them    (C) only (1) and (2)    (D) Only (1) and (3)

(E) only (2) and (3).

(2) Given  $f(x) = 2x^2 - 3x + 2$ , find each of the following:

(A) Find  $f(0)$ ,  $f(-2)$ ,  $f(2)$ .

(B) The x-intercept(s) and y-intercept.

(C)  $\frac{f(x+h) - f(x)}{h} (h \neq 0)$ .

(3) Consider the following function:

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

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

(B) Graph the function.

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

(4) Write a formula for each of the transformations of  $f(x) = \sqrt[3]{x}$

(A) Shift  $f(x)$  3 units to the right.

(B) Reflect  $f(x)$  across the x-axis.

(C) Shift  $f(x)$  2 units down.

(D) Reflect  $f(x)$  across the x-axis, then shift 2 units down.

(5) [10 p.] Determine whether the following are TRUE or FALSE. Give a reason for your answer.

(A) The range of the function  $f(x) = x^2$  is the same as the range of  $g(x) = |x|$ .

(B) Both  $f(x) = x^2$  and  $g(x) = |x|$  have graphs that are symmetric with respect to the  $y$ -axis.

(C) The function  $f(x) = \sqrt[3]{x}$  decreases on its entire domain.

(D) The function  $f(x) = x$  has its domain equal to its range.

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

(A) is positive;

(B) increases;

(C) decreases;

(D) is negative.

(7) Complete the following tables such that:

(A)  $f(x)$  is an even function

$x$	-3	-2	-1	0	1	2	3
$y$	-6		2	0		5	

(B)  $f(x)$  is an odd function

$x$	-3	-2	-1	0	1	2	3
$y$	-6		2	0		5	

(8) Cylindrical cans make the most efficient use of materials when their height is the same as the diameter of their top. ( Volume= $\pi r^2 h$ , Lateral surface area= $2\pi r h$ , Total Surface area= $2\pi r^2 + 2\pi r h$ , where  $r$  is the radius of the top and  $h$  is the height of the cylinder)

(A) Express the volume  $V$  of such a can as a function of the diameter  $d$  of the top.

(B) Express the surface area  $S$  of such a can as a function of the diameter  $d$  of its top.

(9) The area of a rectangle is 64 square inches. Express the perimeter  $P(w)$  as a function of the width  $w$  and state the domain.

(10) Multiple choice problems:

(a) What is the domain of the function :  $f(x) = \sqrt{25 - x^2}$

- (A)  $[5, +\infty)$     (B)  $[-5, 5]$     (C)  $(5, +\infty)$     (D)  $(-5, 5)$     (E) all real numbers.

(b) Identify the equations that determine  $y$  as a function of  $x$ :

(1)  $2y^2 + 3xy - 1 = 0$     (2)  $y - 2x^2 + 3x = 4$     (3)  $\frac{x}{y} \left| \begin{array}{cccccc} 1 & 2 & 3 & 1 & 0 & 9 \\ 3 & 4 & 5 & 6 & 7 & 8 \end{array} \right.$

- (A) only 2    (B) only 2 and 3    (C) only 1 and 2    (D) only 3    (E) all of them.

(c) If  $(6, 3)$  is a point on the graph of  $f(x)$ , which of the following points MUST be on the graph of  $y = f(3x) - 4$

- (A)  $(12, 1)$     (B)  $(2, 1)$     (C)  $(2, -1)$     (D)  $(12, 1)$     (E)  $(2, 3)$ .

(d) The function  $f(x) = -\frac{2}{3}|x + 3| - 4$  is decreasing on:

- (A)  $(-\infty, -3)$     (B)  $(4, +\infty)$     (C)  $(-\infty, 3)$   
 (D) all real numbers    (E)  $(3, +\infty)$ .

(e) Which function(s) has(have)  $(-3)$  as y-coordinate for the y-intercept?

(1)  $f(x) = 2x + 3$     (2)  $f(x) = \frac{1}{5}(x^2 + 2x - 15)$     (3)  $f(x) = \frac{x^2 + 2x - 15}{2x + 5}$

(A) only (1)    (B) all of them    (C) only (1) and (2)    (D) Only (1) and (3)

(E) only (2) and (3).

(11) Given  $f(x) = x^2 + 3x + 7$ , find each of the following:

(A) Find  $f(0)$ ,  $f(-2)$ ,  $f(2)$ .

(B) The x-intercept(s).

(C)  $\frac{f(x+h) - f(x)}{h} (h \neq 0)$ .

(12) Consider the following function:

$$f(x) = \begin{cases} 4x + 1, & \text{if } x < 2 \\ 3x, & \text{if } 2 \leq x \leq 5 \\ 3 - 2x, & \text{if } x > 5 \end{cases}$$

(A) Find  $f(-5)$ ,  $f(0)$ ,  $f(5)$ .

(B) Graph the function.

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

(13) The graph of  $y = \frac{2}{3}| -x| + 6$  can be obtained from the graph of \_\_\_\_\_ by reflecting across the \_\_\_\_\_-axis, vertically compressing by a factor of \_\_\_\_\_, reflected a second time across the \_\_\_\_\_-axis, and shifted vertically \_\_\_\_\_ units in the \_\_\_\_\_ direction.

(14) If  $f(x) = 4x + 3$ , which of the following is true:

(A)  $f(x + h) = 4x + 3 + h$ ;

(B)  $f(x + h) = 4x + 4h + 3$ ;

(C)  $f(x + h) = 4x + 3h$ .

(15) Consider the function  $f(x) = -\sqrt{25 - x^2} + 3$ . Give the interval(s) over which the function:

(A) is positive;

(B) increases;

(C) decreases;

(D) is negative.

(16) Test algebraically if the function is even, odd, or neither even or odd.

(A)  $f(x) = -3x^3 + 2x$

(B)  $f(x) = x - |x|$

(C)  $f(x) = \sqrt[3]{2x^4 - 3}$

(17) A computer system was purchased by a small company for \$12,000 and is assumed to have a depreciated value of \$2,000 after 8 years. If the value is depreciated linearly from \$12,000 to \$2,000:

(A) Write an equation that express the value  $V$ (in dollars) as a function of time  $t$ (in years).

(B) What would be the depreciated value of the system after 5 years?

- (18) If  $x$  units of a product are produced each week and sold for a price of  $\$p$  per unit, then the weekly demand, revenue, and cost equations are, respectively,

$$x = 500 - 10p$$

$$R(x) = 50x - \frac{1}{10}x^2$$

$$C(x) = 20x + 4,000$$

Express the weekly profit as a function of the price  $p$ .

- (19) Multiple choice problems:

(a) What is the domain of the function :  $f(x) = \frac{x + 3}{x^2 + x - 6}$

(A)  $[-3, +\infty)$     (B)  $(-3, 2)$     (C)  $(2, +\infty)$     (D)  $(-\infty, -3)$

(E) all real numbers except -3 and 2.

- (b) Identify the equations that DO NOT determine  $y$  as a function of  $x$ :

(1)  $3y^3 = 4x^3 + 2$     (2)  $xy - x^2 = 3$     (3)  $2x^4 + 3 = y^2$

(A) only 2    (B) only 2 and 3    (C) only 1 and 2    (D) only 3    (E) all of them.

- (c) If  $(-1, 5)$  is a point on the graph of  $f(x)$  and  $(2, b)$  is a point on the graph of  $y = f(x-3)$  then  $b$  is:

(A) 3    (B) 2    (C) 5    (D) -3    (E) -5.

(d) The function  $f(x) = (x + 1)^2 - 4$  is negative on:

- (A)  $(-\infty, -1) \cup (3, +\infty)$     (B)  $(-\infty, -3] \cup [1, +\infty)$     (C)  $(-1, 3)$   
 (D) all real numbers    (E)  $(-3, 1)$ .

(e) Which function(s) has(have)  $-3$  as x-coordinate for a x-intercept?

(1)  $f(x) = 2x + 6$     (2)  $f(x) = x^2 + 2x - 15$     (3)  $f(x) = \frac{x^2 + 2x - 15}{2x + 6}$

- (A) only (1)    (B) all of them    (C) only (1) and (2)    (D) Only (1) and (3)  
 (E) only (2) and (3).

(20) Given  $f(x) = -3x^2 - 4x + 9$ , find each of the following:

(A) Find  $f(0)$ ,  $f(-2)$ ,  $f(2)$ .

(B) The x-intercept(s) and y-intercept(s).

(C)  $\frac{f(-1+h) - f(-1)}{h}$  ( $h \neq 0$ ).

(21) Consider the following function:

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

(A) Find  $f(-1)$ ,  $f(0)$ ,  $f(2)$ .

(B) Graph the function.

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

(22) Find the zeros of  $f(x) = 3x^5 - 20x^3$ . Then without using a graphing calculator, state the zeros of  $f(x - 3)$  and  $f(x + 8)$ .

(23) If  $g(x) = x^2$ , which of the following is true:

(A)  $g(x + h) = x^2 + h$

(B)  $g(x + h) = x^2 + h^2$

(C)  $g(x + h) = x^2 + 2xh + h^2$

- (24) A rancher has 20 miles of fencing to fence a rectangle piece of grazing land along a straight river. If no fence is required along the river and the sides perpendicular to the river are  $x$  miles long, find a formula for the area  $A(x)$  of the rectangle in terms of  $x$ . From practical considerations, what is the domain of the function  $A$ ?
- (25) The fixed costs per day for a doughnut shop are \$300, and the variable costs are \$1.75 per dozen doughnuts produced. If  $x$  dozen doughnuts are produced daily, express the daily cost  $C(x)$  as a function of  $x$ .