

**MATHEMATICS 260 TEST SAMPLE MIDTERM I CHAPTER 2-3 — SUMMER 2006**

**INSTRUCTOR: ANNE SISWANTO; TOTAL POINTS: 100; TIME: 120 MINUTES**

DIRECTION: GRAPHING CALCULATORS ARE NOT ALLOWED. SHOW ALL WORKS ON THE TEST PAPER FOR FULL CREDIT. GIVE JUSTIFICATION FOR ALL THE ANSWERS. LABEL THE COORDINATES.

**THE SAMPLE CONTAINS MORE PROBLEMS THAN THE ACTUAL MIDTERM. DISREGARD THE NUMBER OF POINTS.**

Decide whether or not the points are the vertices of a right triangle.

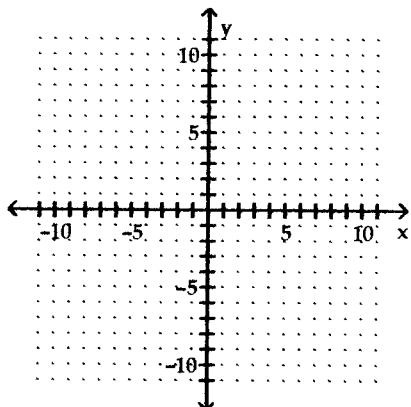
1) (6 POINTS)  $(-9, -8), (-3, -6), (1, -18)$

1) \_\_\_\_\_

Graph the circle.

2) (4 POINTS)  $(x - 1)^2 + y^2 = 16$

2) \_\_\_\_\_



Find the center and radius of the circle.

3) (6 POINTS)  $x^2 + y^2 - 12x - 6y + 20 = 0$

3) \_\_\_\_\_

Solve.

4) (4 POINTS) Find the center-radius form of the equation of the circle having a diameter with endpoints  $(-5, 1)$  and  $(3, 7)$ .

4) \_\_\_\_\_

Find an equation of the line satisfying the conditions. Write the equation in slope-intercept form.

5) (5 POINTS) Through  $(-6, 5)$ ; parallel to  $-7x + 5y = 57$

5) \_\_\_\_\_

6) (5 POINTS) Through  $(-3, 8)$ ; perpendicular to  $-3x + 4y = -23$

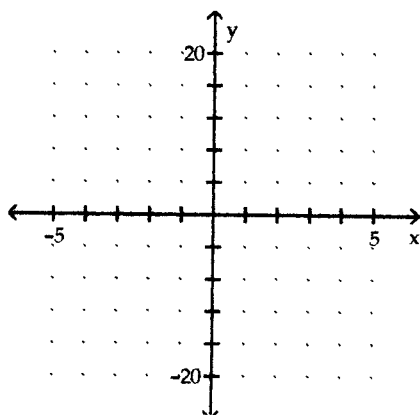
6) \_\_\_\_\_

Graph the function.

7)

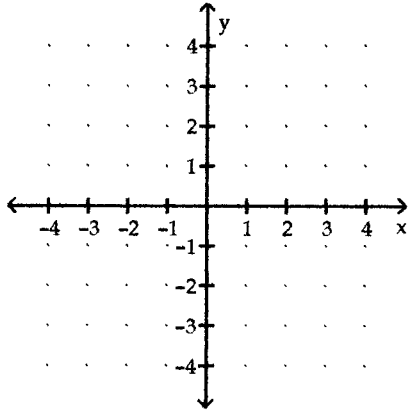
$$f(x) = \begin{cases} 5x + 2 & \text{if } x < -2 \\ x & \text{if } -2 \leq x \leq 3 \\ 4x - 1 & \text{if } x > 3 \end{cases}$$

7)



8) (6 POINTS)  $f(x) = \lfloor x - 1 \rfloor$

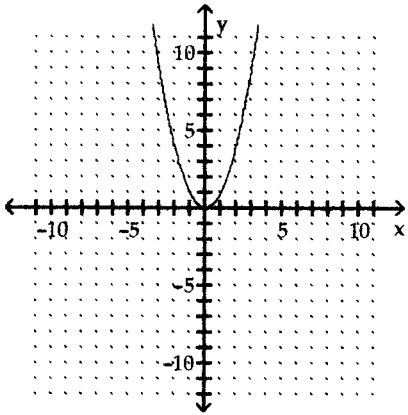
8)



**Graph the transformed function using a dotted line.**

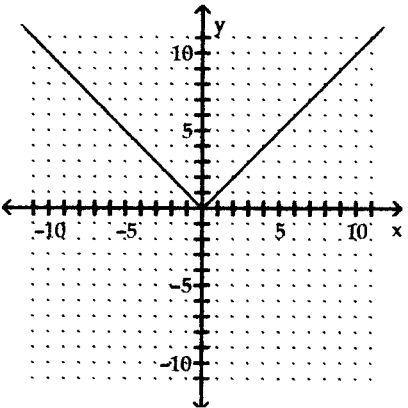
9) (7 POINTS)  $y = -2(x + 3)^2 + 5$

9)



10) (7 POINTS)  $y = \frac{1}{4}|x + 6| - 2$

10)



Determine if the function is even, odd, or neither.

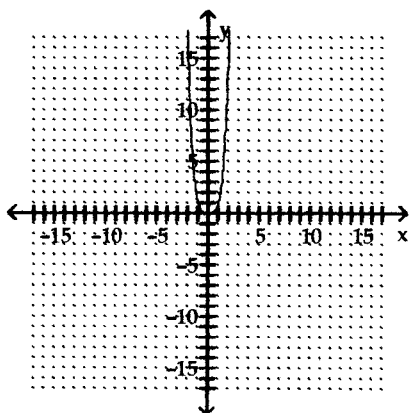
11) (3 POINTS)  $f(x) = -7x^5 + 8x^3$

11) \_\_\_\_\_

Graph the transformed function using a dotted line.

12) (6 POINTS)  $f(x) = -\frac{1}{2}(x + 2)^3 - 2$

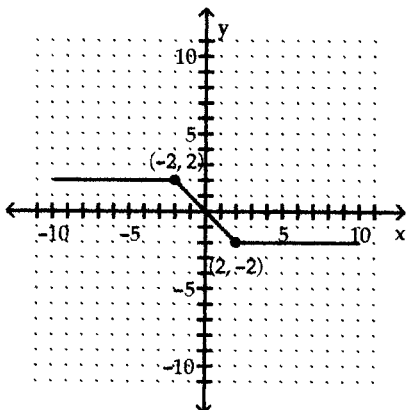
12)



The figure below shows the graph of a function  $y = f(x)$ . Use this graph to solve the problem.

13) (4 POINTS) Sketch the graph of  $y = -2f(x)$ .

13)



Find the domain and range of the indicated function.

14) (2 POINTS) Find the domain and range of  $\left(\frac{f}{g}\right)(x)$  when  $f(x) = 7x^2 - 4x$  and  $g(x) = x^2 - 4x - 9$ .

14) \_\_\_\_\_

**Find the requested value.**

15) (2 POINTS) Using the given tables find  $(f \circ f)(2)$

15) \_\_\_\_\_

x	2	5	3	1
f(x)	3	2	7	9

x	4	2	5	3
g(x)	7	3	9	5

**Find the indicated composite for the pair of functions.**

16) (2 POINTS)  $(g \circ f)(x)$ :  $f(x) = 4x^2 + 3x + 4$ ,  $g(x) = 3x - 8$

16) \_\_\_\_\_

**Solve the problem.**

17) (5 POINTS)

John owns a hotdog stand. He has found that his profit is represented by the equation  $P(x) = -x^2 + 56x + 68$ , with P being profits and x the number of hotdogs sold. How many hotdogs must he sell to earn the most profit?

17) \_\_\_\_\_

**Answer the question.**

18) (5 POINTS)

A quadratic equation  $f(x) = 0$  has a solution  $x = 3$ . Its graph has vertex  $(-1, -16)$ . What is the other solution of the equation?

18) \_\_\_\_\_

Factor  $f(x)$  into linear factors given that  $k$  is a zero of  $f(x)$ .

19) (4 POINTS)  $f(x) = 2x^3 - 3x^2 - 5x + 6$ ;  $k = 1$

19) \_\_\_\_\_

For the polynomial, one zero is given. Find all others.

20) (4 POINTS)  $P(x) = x^3 - 3x^2 + 7x - 5$ ; 1

20) \_\_\_\_\_

Find a polynomial of lowest degree with only real coefficients and having the given zeros.

21) (5 POINTS)  $-8$  (multiplicity 2) and  $\sqrt{5}$

21) \_\_\_\_\_

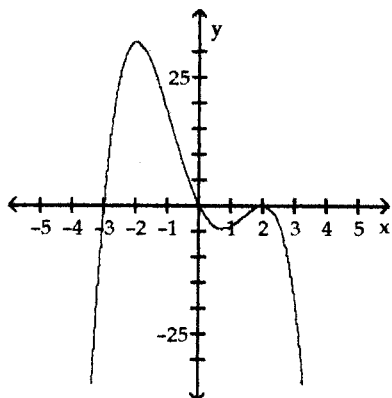
Use Descartes' Rule of Signs to determine the possible number of positive real zeros and the possible number of negative real zeros for the function.

22) (5 POINTS)  $-2x^4 + 2x^3 - 8x^2 + 2x - 4 = 0$

22) \_\_\_\_\_

**Solve the problem.**

- 23) (4 POINTS) The graph of  $f(x) = -x^4 + x^3 + 8x^2 - 12x$  is shown below. Use the graph to factor  $f(x)$ . 23)



**Give the equation of the oblique asymptote, if any.**

24) (2 POINTS)  $f(x) = \frac{x^2 + 4x - 2}{x - 8}$

24) \_\_\_\_\_

**Solve the problem.**

25) (9 POINTS)

Wind resistance or atmospheric drag tends to slow down moving objects. Atmospheric drag varies jointly as an object's surface area  $A$  and velocity  $v$ . If a car traveling at a speed of 40 mph with a surface area of  $33 \text{ ft}^2$  experiences a drag of 171.6 N (Newtons), how fast must a car with  $50 \text{ ft}^2$  of surface area travel in order to experience a drag force of 383.5 N?

25) \_\_\_\_\_

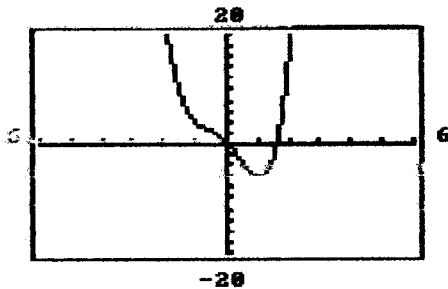
26) (9 POINTS)

The volume of wood in a tree varies jointly as the height of the tree and the square of the distance around the tree trunk. If the volume of wood is 15.84 cubic feet when the height is 22 feet and the distance around the trunk is 3 feet, what is the volume of wood obtained from a tree that is 35 feet tall having a measurement of 5 feet around the trunk?

26) \_\_\_\_\_

Find the equation that the given graph represents.

27)

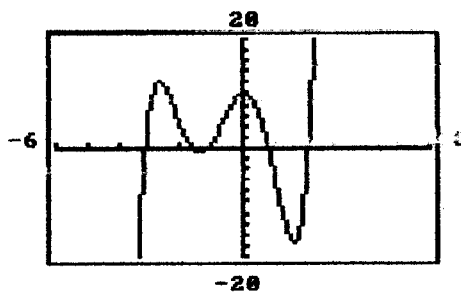


- A)  $P(x) = -3x^5 + x^4 + 2x$   
 C)  $P(x) = -x^4 + x^3 - x$

- B)  $P(x) = 2x^5 + x^3 + 8x^2 - 4x + 3$   
 D)  $P(x) = 2x^4 + x^3 - 3x^2 - 6x$

27) \_\_\_\_\_

28)



- A)  $P(x) = -x^3 + 15x^2 + x - 10$   
 C)  $P(x) = x^5 + 3x^4 - 5x^3 - 15x^2 + x + 10$

- B)  $P(x) = x^4 - 5x^3 + 6x^2 + x + 10$   
 D)  $P(x) = -x^5 - 5x^3 - 6x^2 + 10x$

28) \_\_\_\_\_



Graph the polynomial function. Factor first if the expression is not in factored form.

29) (11 POINTS) LABEL POINTS ON THE GRAPH

29)

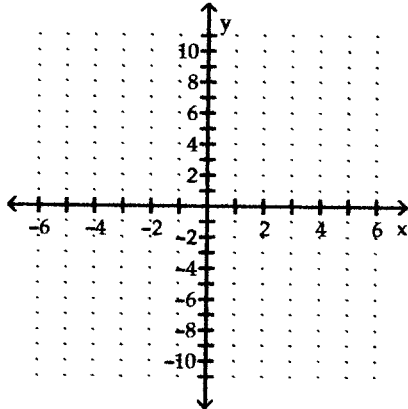
$$f(x) = x^3 + 6x^2 + 9x + 4$$

a. <3> List all possible rational zeros and find all real zeros

b. <1> Find the y-intercept

c. <4> Use test point in each intervals formed by the x-intercept

d. <3> Use end behavior and enough points to plot the graph.



Sketch the graph of the rational function.

30) (11 POINTS) LABEL POINTS ON THE GRAPH

30) \_\_\_\_\_

$$f(x) = \frac{x + 2}{x^2 - 16}$$

a. <2> Find all vertical asymptotes.

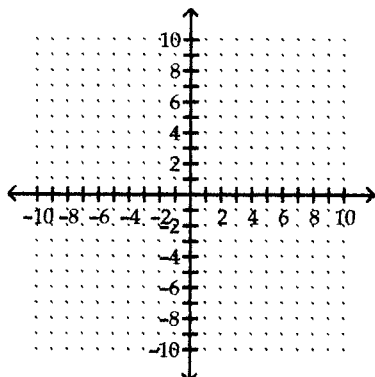
b. <2> Find any horizontal or oblique asymptote.

c. <1> Find the y-intercept.

d. <1> Find the x-intercepts.

e. <2> Determine whether the graph will intersect its nonvertical asymptote.

f. <3> Find enough points in each interval and sketch the graph.



**Graph the function.**

31) (11 POINTS) LABEL POINTS ON THE GRAPH

$$f(x) = \frac{x^2 - x - 6}{x + 4}$$

31) \_\_\_\_\_

a. <1> Find all vertical asymptotes.

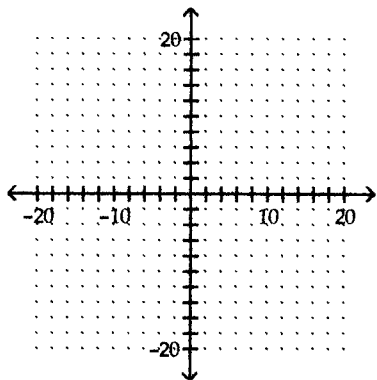
b. <3> Find any horizontal or oblique asymptote.

c. <1> Find the y-intercept.

d. <1> Find the x-intercepts.

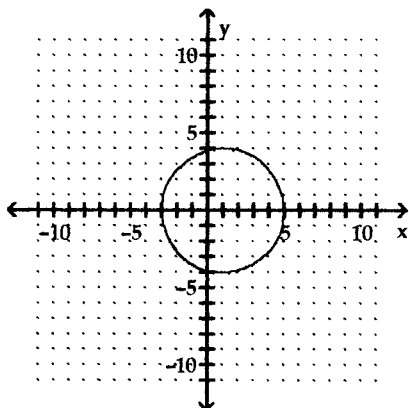
e. <2> Determine whether the graph will intersect its nonvertical asymptote.

f. <3> Find enough points in each interval and sketch the graph.

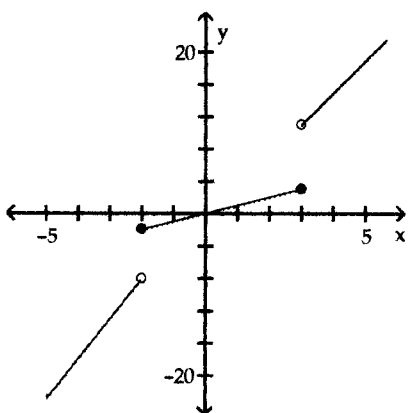


Answer Key  
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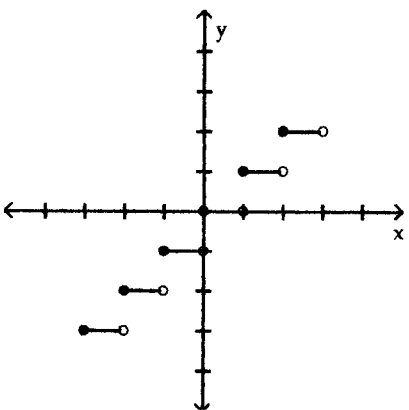
- 1) Yes  
 2)



- 3)  $(6, 3); r = 5$   
 4)  $(x + 1)^2 + (y - 4)^2 = 25$   
 5)  $y = \frac{7}{5}x + \frac{67}{5}$   
 6)  $y = -\frac{4}{3}x + 4$   
 7)

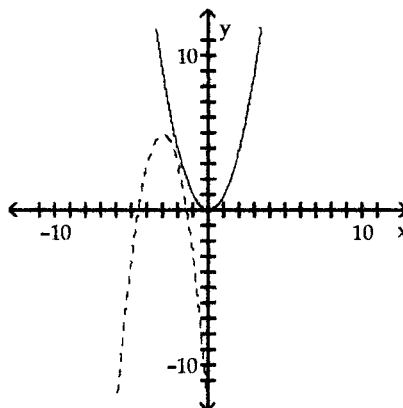


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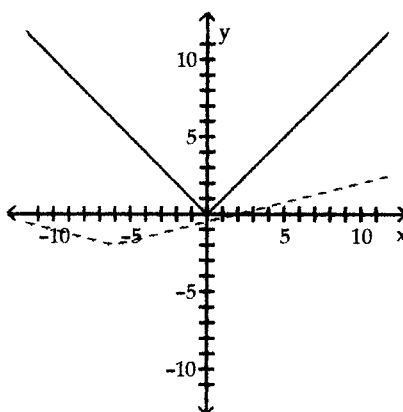


Answer Key  
 Testname: M260T23S

9)

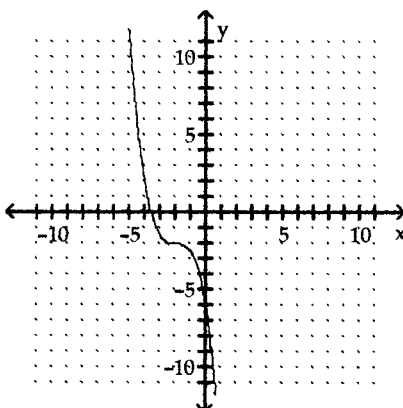


10)



11) Odd

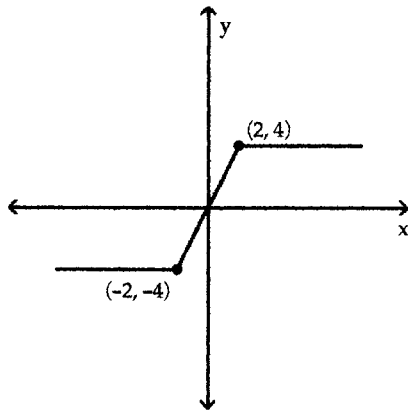
12)



Answer Key

Testname: M260T23S

13)



14) Domain:  $(-\infty, 2 - \sqrt{13}) \cup (2 - \sqrt{13}, 2 + \sqrt{13}) \cup (2 + \sqrt{13}, \infty)$ ; range:  $(-\infty, \infty)$

15) 7

16)  $12x^2 + 9x + 4$

17) 28 hotdogs

18) -5

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

20)  $1 + 2i, 1 - 2i$

21)  $f(x) = x^4 + 16x^3 + 59x^2 - 80x - 320$

22) Positive (4, 2, 0), negative (0)

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

24)  $y = x + 12$

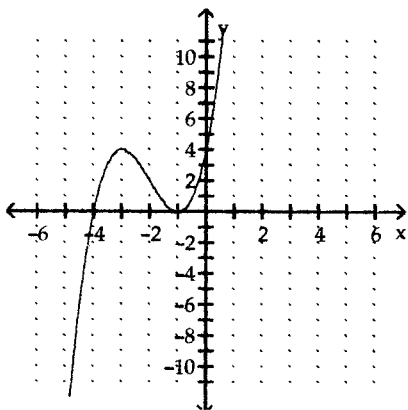
25) 59 mph

26) 70 cubic feet

27) D

28) C

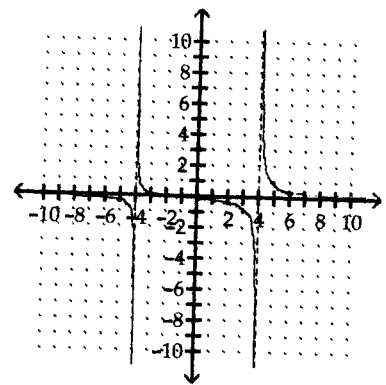
29)



Answer Key

Testname: M260T23S

30)



31)

