

Show all work for each question, including multiple choice questions as appropriate. Full credit will be given only if all work is shown. If the answer to multiple choice is "none of these", write in correct answer. Each question is worth 4 points. Good luck!

1. Find the midpoint of the line segment joining (3.6, -0.2) and (4.8, 0.6).

a. (8.4, 0.4)

b. (0.6, -0.4)

c. (4.2, 0.2)

d. (1.2, -0.8)

e. None of these _____

$$\left(\frac{3.6+4.8}{2}, \frac{-0.2+0.6}{2} \right)$$

$$\left(\frac{8.4}{2}, \frac{.4}{2} \right)$$

C

2. Find the value of x such that the distance between the points (x, -7) and (-2, 5) is 13.

a. 3

b. $-2 + \sqrt{13}$

c. 3 and -7

d. -3 and 7

e. None of these _____

$$169 = (x+2)^2 + (-7-5)^2$$

$$169 = x^2 + 4x + 4 + 144$$

$$0 = x^2 + 4x - 21$$

$$0 = (x+7)(x-3)$$

C

3. Find the x-intercept(s) of $y = x^3 - 16x$ (if they exist). No work needed.

a. (-4, 4)

b. (0, 0), (4, 0), and (-4, 0)

c. (4, 0), and (-4, 0)

d. (0, 0)

e. None of these _____

$$x^3 - 16x = 0$$

$$x(x^2 - 16) = 0$$

$$x(x-4)(x+4) = 0$$

B

4. Find the equation of a circle in standard form: $x^2 + y^2 - 2x + 6y - 15 = 0$

$$(x^2 - 2x) + (y^2 + 6y) = 15$$

$$(x^2 - 2x + 1) + (y^2 + 6y + 9) - 9 = 15$$

★

$$(x-1)^2 + (y+3)^2 = 25$$

5. Use a graphing utility to match the equation with the graph. No work needed.

a. $y = \sqrt{x-3}$

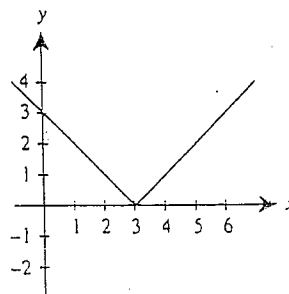
b. $y = |x-3|$

c. $y = (x-3)^2$

d. $y = x-3$

e. none of these

B



6. Identify the type(s) of symmetry: $x^2y^4 + 4xy^2 - 3 = 0$ No work needed.

A
B

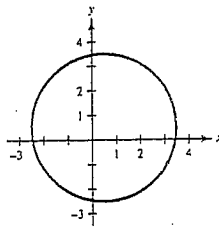
- a. to x-axis
- b. to y-axis
- c. to origin
- d. both a and b
- e. no symmetry

replace y w/ -y **yes**
 replace x w/ -x NO
 replace both NO

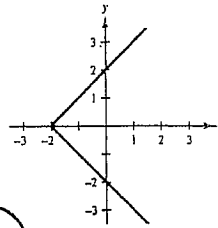
7. Use the vertical line test to determine which of the following is a function. Circle all that are functions. No work needed.

D

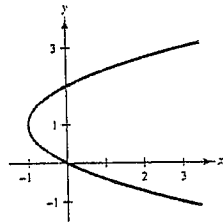
(a)



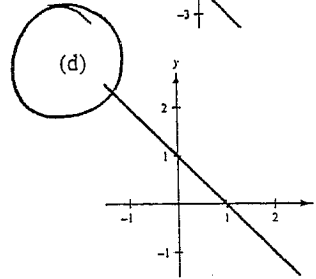
(b)



(c)

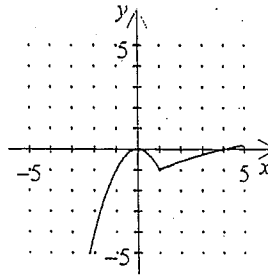


(d)



8. Determine the intervals on which the functions is increasing or decreasing. No work needed.

$$f(x) = \begin{cases} -x^2, & x \leq 1 \\ \sqrt{x} - 2, & x > 1 \end{cases}$$



A

- a. Increasing on $(-\infty, 0)$ and $(1, \infty)$, decreasing on $(0, 1)$
- b. Decreasing on $(-\infty, 0)$ and $(1, \infty)$, increasing on $(0, 1)$
- c. None of these: _____

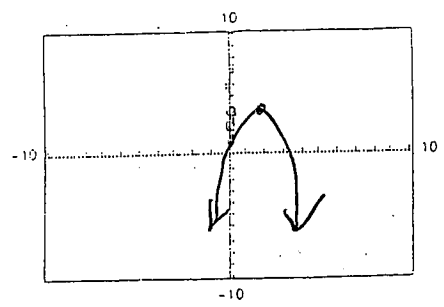
9. State and relative minimum or relative maximum points on the graph of the problem above. No work needed.

Relative minimum (if any): $(1, -1)$ $(-2, -5)$
 Relative maximum (if any): $(0, 0)$ $(0, 5)$ + 2

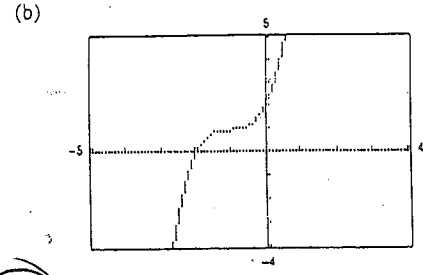
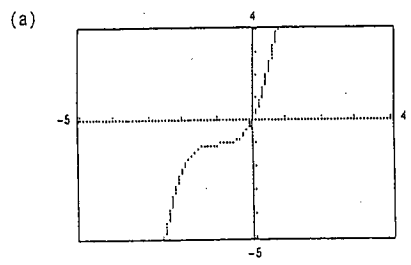
yes both

10. Use a graphing utility to graph the function: $f(x) = -(x-1)^2 + 3$. Sketch the graph in the window below. Use the standard viewing window. No work needed.

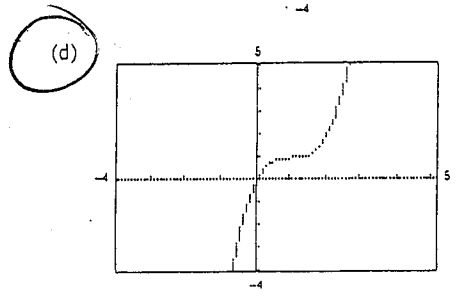
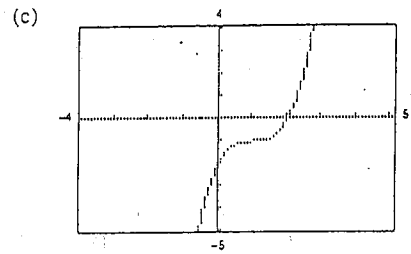
see graph



11. Use a graphing utility to graph the function $f(x) = (x-1)^3 + 1$. Determine which of the following is the graph. Use the standard viewing window. No work needed.



D



12. Find the slope of the line that passes through the points (5, 6) and (-1, 6) and use it to describe the behavior of that line.

C

- a. Rises from left to right
- b. Falls from left to right
- c. Horizontal
- d. Vertical
- e. None of these

slope = $\frac{6-6}{-1-5} = 0$

13. Identify the function that is even;

C

- a. $f(x) = |x+2| - 1$
- b. $f(x) = -2x^7 + 5x^3$
- c. $f(x) = x^6 + x^2 + 1$
- d. $f(x) = x^3 - x$

replace x w/ $-x$
get same equation

14. What sequence of transformations will yield the graph of $g(x) = \sqrt[3]{x-3} + 2$ from the graph of $f(x) = \sqrt[3]{x}$.

- a. moves 2 to the left and down 3
 b. moves 3 to the right and up 2
 c. moves 3 to the left and down 2
 d. moves 2 to the right and up 3
 e. None of these: _____

3 → right
 2 ↑ up

B

15. Find the domain of the function: $f(x) = \frac{3}{x+2}$.

Domain = $\{x \mid x \neq -2\}$ all Reals except -2

16. Find the slope-intercept form of the equation that passes through the points (2, -1) and (-2, -6).

Equation: _____

$y = \frac{+5}{4}x - \frac{7}{2}$

$m = \frac{-1+6}{2+2} = \frac{+5}{4}$

$y + 1 = \frac{+5}{4}(x - 2)$

$y = \frac{+5}{4}x + \frac{-5}{2} - 1 = \frac{5}{4}x - \frac{7}{2}$

17. A business had annual retail sales of \$110,000 in 2004 and sales of \$224,000 in 2007. Assuming that the annual increase in sales follows a linear pattern, find a mathematical model that gives the amount of sales S, in terms of years T after 2004. (Assume T = 0 in 2004)

$S = 38,000T + 110,000$ $\frac{224,000 - 110,000}{7 - 4} = \frac{114,000}{3} = 38,000$

18. Use the model to find the retail sales in 2006.

- a. ~~\$182,000~~
 b. \$186,000
 c. \$188,000
 d. \$195,000
 e. None of these: _____

~~T = 2~~ T = 2

$38,000(2) + 110,000 = 186,000$

19. Given $f(x) = \begin{cases} 7x - 10, & x \leq 2 \\ x^2 + 6, & x > 2 \end{cases}$, find $f(0)$.

$$7(0) - 10 = -10$$

A

- a. -10
- b. 0
- c. 6
- d. None of these: _____

20. Which of the functions fits the data? No work needed.

X	-2	0	1	3	5	10
f(x)	-6	0	3	9	15	30

C

- a. $f(x) = x^3$
- b. $f(x) = \sqrt[3]{x}$
- c. $f(x) = 3x$
- d. none of these

21. If $f(x) = x - 2$, and $g(x) = 6 - 2x$, find $(f + g)(2)$

$$f(2) = 0$$

$$g(2) = 2$$

B

- a. 6
- b. 2
- c. -14
- d. None of these: _____

22. If $f(x) = \sqrt{x-2}$, and $g(x) = \sqrt{9-x^2}$, find $\left(\frac{f}{g}\right)(x)$ and its domain.

$$\left(\frac{f}{g}\right)(x) = \frac{\sqrt{x-2}}{\sqrt{9-x^2}}$$

Domain = ~~$-3 \leq x \leq 3$~~
 $2 \leq x < 3$

23. If $f(x) = x^2 - 2x$, and $g(x) = 2x + 3$, find $(f \circ g)(x)$

A

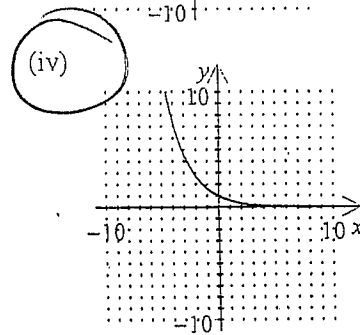
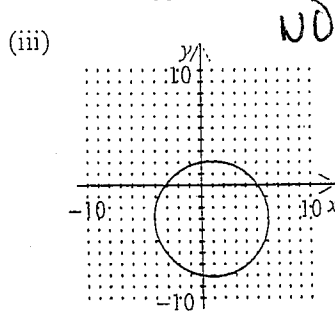
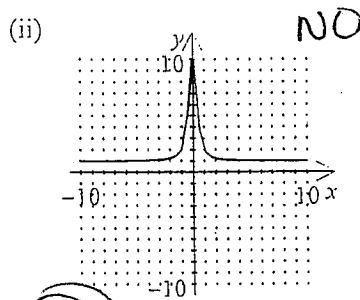
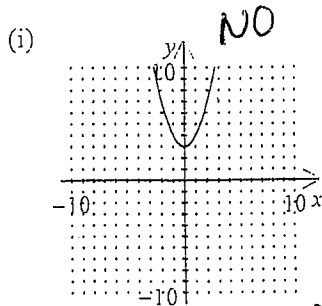
- a. $4x^2 + 8x + 3$
- b. $2x^2 - 4x + 3$
- c. $3x^2 + x$
- d. None of these; _____

$$(2x+3)^2 - 2(2x+3)$$

$$4x^2 + 12x + 9 - 4x - 6$$

$$= 4x^2 + 8x + 3$$

24. Determine which of the following functions has an inverse. Circle all that work. No work needed.



IV

25. Find the inverse of the function: $f(x) = \frac{x+3}{2}$.

$$x = \frac{y+3}{2}$$

$$y = 2x - 3$$

$$2x = y + 3$$

$$f^{-1}(x) = 2x - 3$$

26. Show that $f(x) = (x+3)^2$, $x \geq -3$ and $g(x) = \sqrt{x} - 3$, $x \geq 0$ are inverse functions.

$$f(g(x)) = \sqrt{(x+3)^2} - 3 = x + 3 - 3 = x$$

and $g(f(x)) = (\sqrt{x} - 3 + 3)^2 = (\sqrt{x})^2 = x$