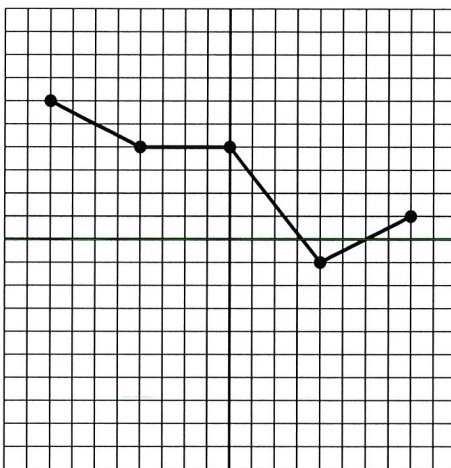


There are 16 problems on this exam. Carefully read and follow all directions. In order to receive credit show all necessary work. No credit will be given for an answer I cannot find or cannot read. All answers should be exact unless specified otherwise.

1. Use the graph of the function F shown below to determine the following. (4 points each)



- (a) Domain of F

$$[-8, 8]$$

- (b) Range of F

$$[-1, 6]$$

- (c) $F(-8)$

$$= 6$$

- (d) y -intercept

$$(0, 4)$$

- (e) x -intercept(s)

$$\left(\frac{16}{5}, 0\right) (6, 0)$$

- (f) The intervals for x where F is increasing

$$(4, 8)$$

- (g) The intervals for x where F is decreasing

$$(-8, -4) \cup (0, 4)$$

- (h) The intervals for x where F is constant

$$(-4, 0)$$

- (i) Classify the point $(4, -1)$ as an extreme point. If the point is not an extreme point write NONE.

local and absolute min

Use the three functions given below to determine the specified information in problems 2-11. (4 points each)

$$a(x) = \frac{3}{x^2-9}$$

$$b(x) = \sqrt{x-7} + 3$$

$$c(x) = x^2 - 4x + 4$$

2. Domain of $a(x)$

$$x \neq -3, 3$$

3. Domain of $b(x)$

$$x \geq 7$$

4. Domain of $c(x)$

$$(-\infty, \infty)$$

5. Range of $b(x)$

$$y \geq 3$$

6. Range of $c(x)$

$$y \geq 0$$

7. $(b+c)(16)$

$$\begin{aligned} &= b(16) + c(16) \\ &= 6 + 196 \\ &= 202 \end{aligned}$$

8. $(b-c)(16)$

$$\begin{aligned} &= 6 - 196 \\ &= -190 \end{aligned}$$

9. $(bc)(16)$

$$\begin{aligned} &= 6 \cdot 196 \\ &= 1176 \end{aligned}$$

10. $\left(\frac{b}{c}\right)(16)$

$$= \frac{6}{196} = \frac{3}{98}$$

11. $b(x-3)$

$$\begin{aligned} &= \sqrt{x-3-7} + 3 \\ &= \sqrt{x-10} + 3 \end{aligned}$$

Determine whether or not each of the following relations is a function. Circle YES if the relation is a function and circle NO if the relation is not a function. (2 points each)

12. YES NO

$$\{(4, 0), (5, -1), (7, 2), (6, 0)\}$$

13. YES NO

$$\{(5, 0), (7, 0), (5, 2), (1, -3)\}$$

14. YES NO

$$y = x^3$$

15. YES NO

$$x + y^2 = 4$$

16. Use the function $G(x) = x^2 + 3x$ to determine the following. (4 points each)

(a) Domain of G

$$(-\infty, \infty)$$

(b) Range of G

$$\left[-\frac{9}{4}, \infty\right)$$

(c) $G(-9)$

$$= 54$$

(d) x -intercept(s)

$$(0, 0), (-3, 0)$$

(e) Determine the difference quotient, $\frac{G(x+h)-G(x)}{h}$, for the function G defined above. Simplify your answer.

$$\begin{aligned} & \frac{(x+h)^2 + 3(x+h) - (x^2 + 3x)}{h} \\ &= \frac{\cancel{x^2} + 2xh + h^2 + \cancel{3x} + 3h - \cancel{x^2} - \cancel{3x}}{h} \\ &= 2x + h + 3 \end{aligned}$$