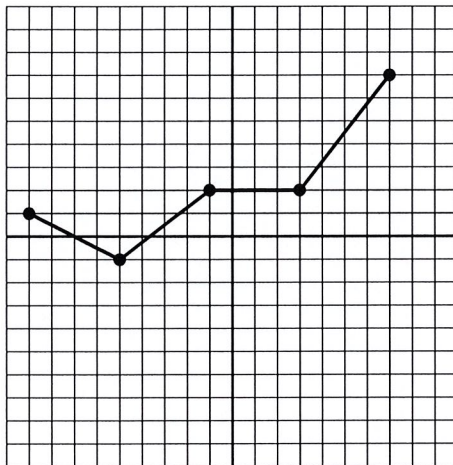


There are 16 problems on this exam. Carefully read and follow all directions. In order to receive credit show all necessary work. No credit will be given for an answer I cannot find or cannot read. All answers should be exact unless specified otherwise.

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



- (a) Domain of F

$$[-9, 7]$$

- (b) Range of F

$$[-1, 7]$$

- (c) $F(-9)$

$$= 1$$

- (d) y -intercept

$$(0, 2)$$

- (e) x -intercept(s)

$$(-7, 0) \left(\frac{11}{3}, 0\right)$$

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

$$(-5, -1) \cup (3, 7)$$

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

$$(-9, -5)$$

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

$$(-1, 3)$$

- (i) Classify the point $(3, 2)$ as an extreme point. If the point is not an extreme point write NONE.

local minimum

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

$$a(x) = \frac{1}{x^2 - 81}$$

$$b(x) = \sqrt{x - 5} + 1$$

$$c(x) = x^2 + 2x + 1$$

2. Domain of $a(x)$

$$x \neq -9, 9$$

3. Domain of $b(x)$

$$x \geq 5$$

4. Domain of $c(x)$

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

5. Range of $b(x)$

$$y \geq 1$$

6. Range of $c(x)$

$$y \geq 0$$

7. $(b + c)(86)$

$$\begin{aligned} &= b(86) + c(86) \\ &= 10 + 7569 \\ &= 7579 \end{aligned}$$

8. $(b - c)(86)$

$$\begin{aligned} &= 10 - 7569 \\ &= -7559 \end{aligned}$$

9. $(bc)(86)$

$$\begin{aligned} &= 10 \cdot 7569 \\ &= 75690 \end{aligned}$$

10. $\left(\frac{b}{c}\right)(86)$

$$= \frac{10}{7569}$$

11. $b(x - 3)$

$$\begin{aligned} &= \sqrt{x - 3 - 5} + 1 \\ &= \sqrt{x - 8} + 1 \end{aligned}$$

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

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

13. YES NO

$$\{(3, -1), (0, 1), (4, 0), (5, 2)\}$$

14. YES NO

$$x = y^2$$

15. YES NO

$$x^3 + y^3 = 4$$

16. Use the function $G(x) = x^2 + 3x - 18$ to determine the following. (4 points each)

(a) Domain of G

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

(b) Range of G

$$\left[-\frac{81}{4}, \infty\right)$$

(c) $G(-8)$

$$= 22$$

(d) x -intercept(s)

$$(-6, 0) (3, 0)$$

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

$$\begin{aligned} & \frac{(x+h)^2 + 3(x+h) - 18 - (x^2 + 3x - 18)}{h} \\ &= \frac{\cancel{x^2} + 2xh + \cancel{h^2} + \overset{h}{3x} + 3h - 18 - \cancel{x^2} - \cancel{3x} + 18}{h} \\ &= 2x + h + 3 \end{aligned}$$