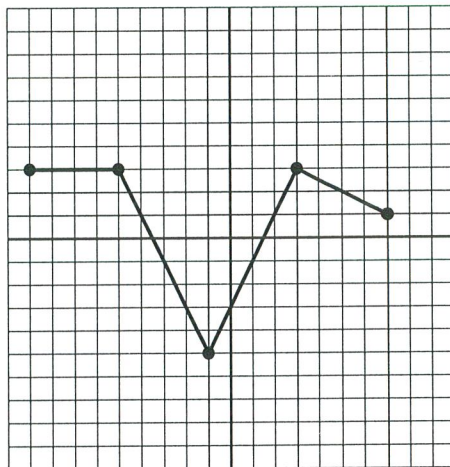


There are 16 problems on this exam. Carefully read and follow all directions. In order to receive credit show all necessary work. No credit will be given for an answer I cannot find or cannot read. All answers should be exact unless specified otherwise.

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  $F$

$$[-5, 3]$$

- (c)  $F(-9)$

$$3$$

- (d)  $y$ -intercept

$$(0, -3)$$

- (e)  $x$ -intercept(s)

$$(-3.5, 0), (1.5, 0)$$

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

$$[-1, 3]$$

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

$$[-5, -1] \cup [3, 7]$$

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

$$[-9, -5]$$

- (i) Classify the point  $(-1, -5)$  as an extreme point. If the point is not an extreme point write NONE.

local and absolute minimum

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

$$a(x) = \frac{-3}{x-10} \quad b(x) = \sqrt{x+10} \quad c(x) = x^2 - 2$$

2. Domain of  $a(x)$

$$x \neq 10$$

3. Domain of  $b(x)$

$$x \geq -10$$

4. Domain of  $c(x)$

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

5. Range of  $b(x)$

$$y \geq 0$$

6. Range of  $c(x)$

$$[-2, \infty)$$

$$\begin{aligned} 7. (b+c)(6) &= b(6) + c(6) \\ &= 4 + 34 \\ &= 38 \end{aligned}$$

$$\begin{aligned} 8. (b-c)(6) &= 4 - 34 \\ &= -30 \end{aligned}$$

$$\begin{aligned} 9. (b \cdot c)(6) &= 4 \cdot 34 \\ &= 136 \end{aligned}$$

$$10. \left(\frac{b}{c}\right)(6) = \frac{4}{34} = \frac{2}{17}$$

$$11. a(x-3) = \frac{-3}{x-3-10} = \frac{-3}{x-13}$$

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

$$y = x^3$$

13. YES NO

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

14. YES

NO

$$\{(-4, -5), (-6, 3), (-4, -1), (0, 0)\}$$

15. YES NO

$$x + y = 4$$

16. Use the function  $G(x) = -2x^2 + 10x$  to determine the following. (4 points each)

(a) Domain of  $G$

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

(b) Range of  $G$

$$y \leq 12.5$$

(c)  $G(-8)$

$$\begin{aligned} &= -2(-8)^2 + 10(-8) \\ &= -208 \end{aligned}$$

(d)  $x$ -intercept(s)

$$(0, 0), (5, 0)$$

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

$$\begin{aligned} & \frac{[-2(x+h)^2 + 10(x+h)] - [-2x^2 + 10x]}{h} \\ &= \frac{-2(x^2 + 2xh + h^2) + 10x + 10h + 2x^2 - 10x}{h} \\ &= \frac{-2x^2 - 4xh - 2h^2 + 10x + 10h + 2x^2 - 10x}{h} = -4x - 2h + 10 \end{aligned}$$