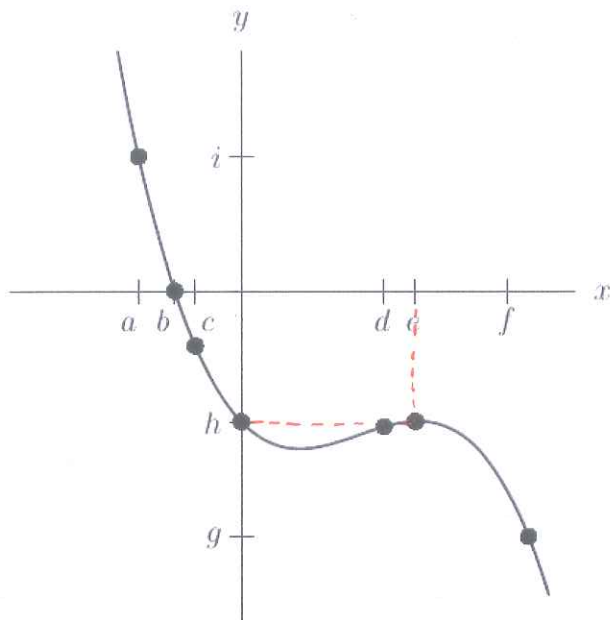


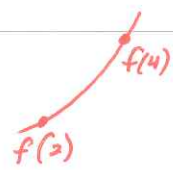
1. Let  $y = p(x)$  be defined by the following graph. What is  $p(e)$ ?



$p(e) = h$

2. If  $f(x)$  is an increasing function, which of the following must be true.

- A)  $f(4) > f(2)$
- B)  $f(4) < f(2)$
- C)  $\frac{f(2) - f(4)}{2 - 4} > 0$
- D) For some value of  $x \neq 4$ ,  $f(x) = f(4)$



IF  $f(4) > f(2)$   
 then  $f(2) - f(4)$   
 is negative  
 $\frac{(-)}{-2} = +$

3. Suppose there are 110 people living in a small town and the rate of change of the town's population is 8 people per year. How many people will be living in the town twenty years from now?

$$y = 110 + 8x$$

$$y = 110 + 8(20)$$

$$y = 110 + 160$$

$$y = 270 \text{ people}$$

4. The distance traveled by a car is  $D(t) = 65t$  miles, where  $t$  is the number of hours driven. What is the slope?

$65$

5. Find a formula for the linear function that passes through the point (2,4) with slope 3.

$$y = mx + b$$

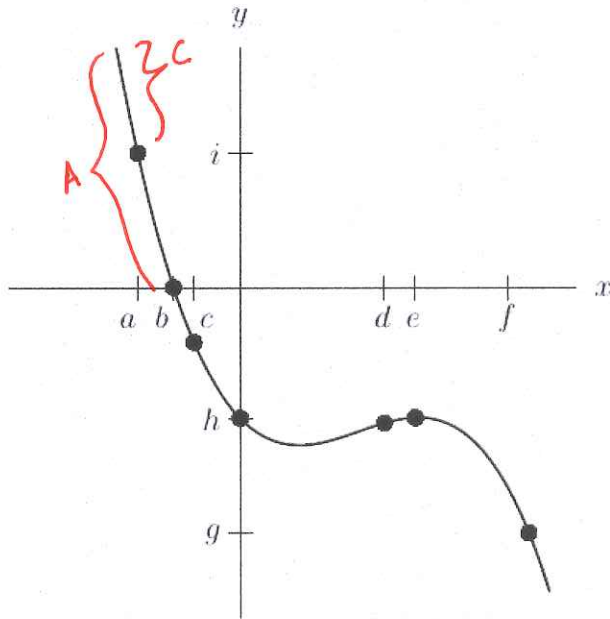
$$4 = 3(2) + b$$

$$4 = 6 + b$$

$$-2 = b$$

$$y = 3x - 2$$

6. Let  $y = p(x)$  be defined by the following graph. Which of the following are true?



- A) If  $p(x) > 0$ , then  $x < b$ .  
 B) If  $p(x) > 0$ , then  $x > b$ .  
 C) If  $p(x) > i$ , then  $x < a$ .  
 D) If  $p(x) > i$ , then  $x > a$ .

7. The distance traveled by a car is  $D(t) = 50t$  miles, where  $t$  is the number of hours driven. What is the meaning of the number 50? (Mark all that apply)

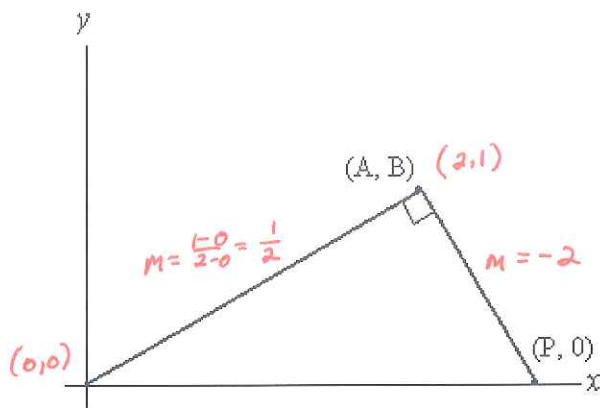
- A) The vertical intercept  
 B) The slope  
 C) The total distance traveled  
 D) The speed of the car

8. Mark all of the following functions that pass through the point  $(0, 2)$ .

- A)  $\frac{1}{2}f(x) - 1 = x$        $\frac{1}{2}(2) - 1 = 0$        $1 - 1 = 0$        $0 = 0$   
 B)  $-\frac{1}{2}g(x) = x + 1$        $-\frac{1}{2}(2) = 0 + 1$        $-1 \neq 1$   
 C)  $4h(x) - x = 2$        $4(2) - 0 = 2$        $8 - 0 = 2$        $8 \neq 2$   
 D)  $j(x) = 2x$        $2 = 2(0)$        $2 \neq 0$   
 E)  $k(x) = 2$        $2 = 2$   
 F)  $5p(x) - x = 2$        $5(2) - 0 = 2$        $10 - 0 = 2$        $10 \neq 2$

9. Let  $y = b + mx$  define a linear function with y-intercept 0 that passes through the point  $(2, -2)$ . Then  $b = \underline{0}$  and  $m = \underline{-1}$ .       $(0,0) (2,-2)$        $m = \frac{-2-0}{2-0} = \frac{-2}{2} = -1$

10. In the following figure, let  $A = 2$  and  $B = 1$ . Find the equation of the line through  $(A, B)$  and  $(P, 0)$  and use it to find the value of  $P$ .



$$\begin{aligned}
 y &= mx + b \\
 1 &= -2(2) + b \\
 1 &= -4 + b \\
 5 &= b
 \end{aligned}$$

$$y = -2x + 5$$

$$0 = -2P + 5$$

$$\frac{-5}{-2} = \frac{-2P}{-2}$$

$$\frac{5}{2} = P$$

$$2.5 = P$$

11. The following tables give the profits (in millions) of a manufacturing company  $t$  months after January 1, 2008.

$t$ (months)	0	2	3	4	5	6	8	9	10	11
$r$ (millions)	5.2	6.1	4.2	5.1	5.9	6.5	6.1	7.3	6.2	5.9

Use a calculator program to find the regression line for this data. What is the physical interpretation of the  $r$ -intercept?

$$y = .132x + 5.084$$

The  $y$ -intercept is the profit during January 2008.

12. Suppose that your uncle Gerald has just opened a store that sells television sets. Let  $P(x)$  represent the profit that he makes selling  $x$  television sets per week. Suppose that he currently sells  $k$  television sets per week. What is the practical interpretation of  $P(k+10)$ ?

- A) The profit he currently makes plus \$10.  
 B) The number of additional television sets he would have to sell per week to obtain an additional \$10 profit.  
 C) The profit he would make if he sold 10 more television sets per week than he currently sells.  
 D) The number of television sets he currently sells plus 10.

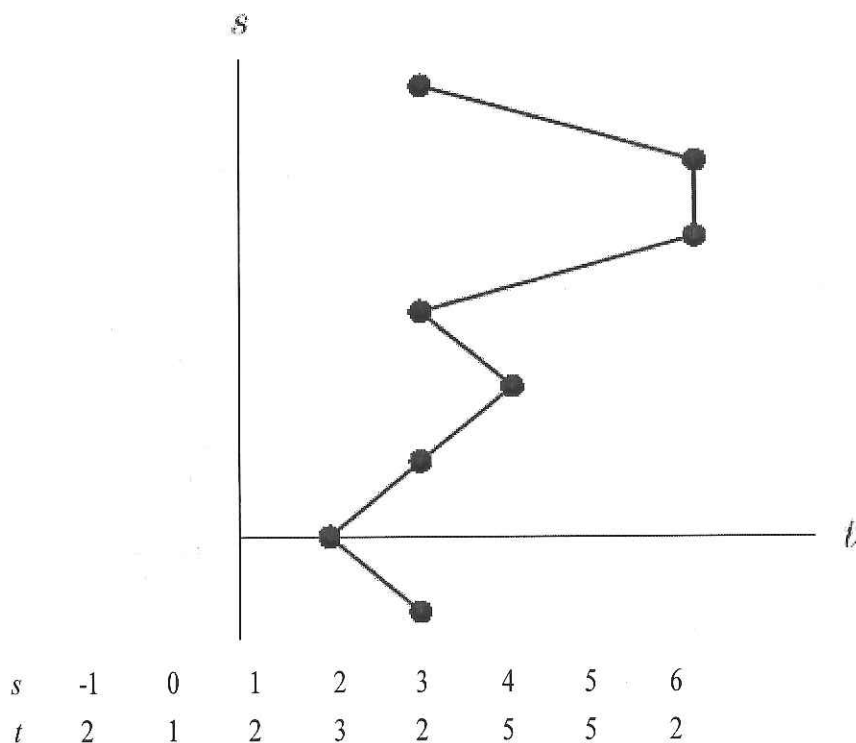
13. At a price of \$2.70 per gallon, the average weekly demand by consumers for gasoline is 40 gallons. If the price rises to \$2.75, the weekly demand drops to 38 gallons. Assuming demand is linear, let  $Q = b + mp$ , where  $Q$  is the weekly quantity of gasoline demanded and  $p$  is the price per gallon. Then  $b = 148$  and  $m = -40$ .

$$\begin{aligned}
 y &= Q \\
 x &= p
 \end{aligned}$$

$$\begin{aligned}
 &(2.70, 40) \quad (2.75, 38) \\
 m &= \frac{38 - 40}{2.75 - 2.70} = \frac{-2}{.05} = -40
 \end{aligned}$$

$$\begin{aligned}
 40 &= -40(2.70) + b \\
 40 &= -108 + b \\
 148 &= b
 \end{aligned}$$

14. The data points for the following table are graphed in the figure below.



Is this the graph of a function?

*NO - FAILS VERTICAL LINE TEST*

15. What is the domain of the function  $f(x) = \frac{5}{\sqrt{4-x^2}}$ ?

- A)  $-5 < x < 5$
- B)  $-5 \leq x \leq 5$
- C)  $-2 < x < 2$
- D)  $-2 \leq x \leq 2$

*Handwritten work:*  
 $4 - x^2 > 0$   
 $4 > x^2$   
 $x^2 < 4$   
 $-2 < x < 2$

16. What is the range of the function  $y = \frac{15}{\sqrt{25-x^2}}$ ?

- A)  $y \geq 5$
- B)  $y \leq 5$
- C)  $y \geq 15$
- D)  $y \leq 15$
- E)  $y \geq 3$
- F)  $y \leq 3$

*Handwritten work:*  
 ↑  
 must be greater than or equal to zero  
 $0 < \sqrt{25-x^2} \leq 5$

*Handwritten work:*  
 $\frac{15}{5} = 3$

17. Given the domain  $-2 \leq x \leq 3$ , the range of  $f(x) = x^2 - 1$  is  $-1 \leq y \leq 8$ .



$(-2)^2 - 1 = 4 - 1 = 3$      $3^2 - 1 = 9 - 1 = 8$     Vertex  $x=0: 0^2 - 1 = -1$

18. Given the following table of values, can you conclude that  $f(x) = g(x)$ ?

$x$	0	1	2	3	4	5
$f(x)$	6	7	9	12	16	21
$g(x)$	6	7	9	12	16	21

*No - ONLY THESE POINTS ARE CONGRUENT, DON'T KNOW ABOUT REST OF FUNCTION*

19. Which of the following is a piecewise formula for the function  $f(x) = |2x - 10|$

(A)  $f(x) = \begin{cases} 10 - 2x, & x \leq 5 \\ 2x - 10, & x > 5 \end{cases}$

B)  $f(x) = \begin{cases} 2x - 10, & x \leq 5 \\ 10 - 2x, & x > 5 \end{cases}$

C)  $f(x) = \begin{cases} 10 - 2x, & x \leq 10 \\ 2x - 10, & x > 10 \end{cases}$

D)  $f(x) = \begin{cases} 2x - 10, & x \leq 10 \\ 10 - 2x, & x > 10 \end{cases}$

$f(x) = 2x - 10$  when  $x > 5$     or     $f(x) = -(2x - 10)$  when  $x \leq 5$   
 $f(x) = -2x + 10$

20. Let  $f(x) = \begin{cases} -3, & -9 \leq x \leq -1 \\ x - 2, & -1 < x < 3 \\ 2x + 1, & 3 \leq x \leq 6 \end{cases}$

$f(x) = 3$   
 $-3 \leq f(x) < 1$   
 $7 \leq f(x) \leq 13$

a) What is the domain of  $f$ ?

b) What is the range of  $f$ ?

$-9 \leq x \leq 6$   
 $-3 \leq f(x) < 1$  or  $7 \leq y \leq 13$

21. Suppose  $f$  and  $g$  are invertible functions such that  $f(-10) = -14$ ,  $f(-13) = -7$ ,

$f(-7) = -12$ ,  $g(-15) = -13$ ,  $g(-11) = -7$ ,

and  $g(-7) = -14$ . Find  $f^{-1}(g(f(-13)))$ .

$f(-13) = -7$

$g(-7) = -14$

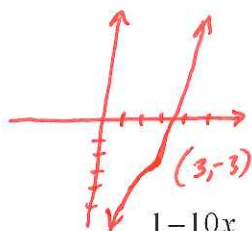
$f^{-1}(-14) = -10$

22. A model rocket is launched from the roof of a building. For height  $h$ , in meters, and time  $t$ , in seconds, after the rocket is launched, the height of the rocket above the ground is given

by  $h = f(t) = -4.9t^2 + 42t + 18$ . Is the graph of  $f(t)$  concave up or concave down?

*Concave Down*

23. Graph  $f(x) = (x-3)^3 - 3$  and use the graph to give an estimate of the largest interval on which the function is concave up.



Concave up when  $x > 3$

24. Suppose  $g(x) = \frac{1-10x}{7}$  and suppose that  $f$  is an invertible function such that

$f^{-1}(x) = 3(x-5)$ . Find  $f(g(x))$  and write it in the form  $ax+b$ .

$$x = 3(y-5)$$

$$\frac{x}{3} = y-5$$

$$\frac{x}{3} + 5 = y$$

$$f(x) = \frac{1}{3}x + 5$$

$$f(g(x)) = \frac{1}{3} \left( \frac{1-10x}{7} \right) + 5$$

$$= \frac{1-10x}{21} + 5$$

$$= \frac{1}{21} - \frac{10}{21}x + 5$$

$$= \frac{1}{21} - \frac{10}{21}x + \frac{105}{21}$$

$$= \frac{-10}{21}x + \frac{106}{21}$$

25. Find the zeros of  $y = 25x^2 + 80x + 15$  by factoring.

$$0 = 5(5x^2 + 16x + 3)$$

$$0 = 5(5x+1)(x+3)$$

$$5x+1=0 \quad x+3=0$$

$$5x = -1 \quad x = -3$$

$$x = -\frac{1}{5} \quad x = -3$$

$$\boxed{5x} \quad \textcircled{1}$$

$$\boxed{x} \quad \textcircled{3}$$

26. For  $f(x) = 4x^2$ , does  $f\left(\frac{3}{2}\right) = \frac{f(3)}{f(2)}$ ?

$$f\left(\frac{3}{2}\right) = 4\left(\frac{3}{2}\right)^2$$

$$= 4\left(\frac{9}{4}\right)$$

$$= 9$$

$$\frac{f(3)}{f(2)} = \frac{4(3)^2}{4(2)^2} = \frac{4 \cdot 9}{4 \cdot 4} = \frac{9}{4}$$

No!

27. Which of the following parabolas have a vertex of  $(6, -6)$ ?

A)  $y = -3(x-6)^2 - 6$

B)  $y = 4(x+6)^2 + 6$

C)  $y = -8(x+6)^2 - 6$

D)  $y = 6x^2 - 72x + 210 \rightarrow 6(x^2 - 12x) + 210$

E)  $y = 4x^2 + 48x + 150$

$$6(x^2 - 12x + 36) + 210 - 216$$

$$6(x-6)^2 - 6$$

$$4(x^2 + 12x) + 150$$

$$4(x^2 + 12x + 36) + 150 - 144$$

$$4(x+6)^2 + 6$$