

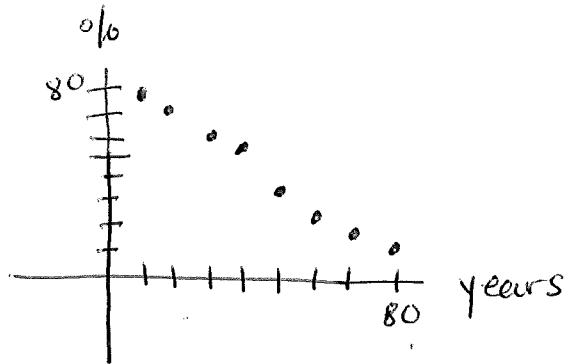
Key

(D. Howard 3-16)

Show all work for partial credit.

1. The table below shows the percent,  $p$ , of state workers living in Alpha County for selected years,  $t$ .

Years, $t$	Percent, $p$
1910	78.5
1920	72.9
1930	58.1
1940	51.5
1950	38.2
1960	27.1
1970	16.7
1980	10.1



- (2) a. Is the percentage of state workers that live in Alpha County a function of the year? Why or why not? Yes, For each input, there is only one output.

- (2) b. Find  $f(1970)$  if  $p = f(t)$

$$f(1970) = \boxed{16.7}$$

- (2) c. Find  $t$  if  $f(t) = 16.7$

$$f(\boxed{1970}) = 16.7$$

$$t = 1970$$

- (2) d. Write a sentence explaining the meaning of  $f(1980) = 10.1$  in the context of the problem. In 1980, there were 10.1% of state workers living in Alpha County.

2. Determine the domain of  $f(x) = \sqrt{4x - 5}$ . You may write the answer as an interval or an inequality.

9

$$\begin{array}{r} 4x - 5 \geq 0 \\ +5 \quad +5 \\ \hline \end{array}$$

$$\begin{array}{r} 4x \geq 5 \\ \frac{4x}{4} \geq \frac{5}{4} \end{array}$$

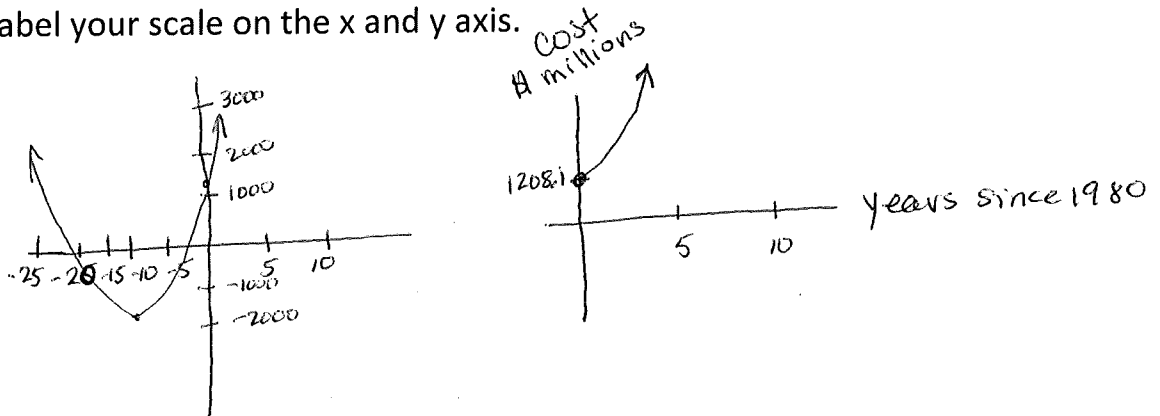
$$\boxed{x \geq 5/4} \text{ or } \boxed{\left[ \frac{5}{4}, \infty \right)}$$

3. The cost (in millions of dollars) of a certain state program can be described by

$$L(t) = 32.6t^2 + 711.4t + 1208.1, \text{ where } t \text{ is the number of years after 1980.}$$

- a. Sketch the graph of this function in an appropriate viewing window. Label your scale on the x and y axis.

5



- b. What was the cost of the state program in 2003?

5

$$\begin{array}{r} 2003 \\ -1980 \\ \hline t = 23 \end{array}$$

$$L(23) = 32.6(23)^2 + 711.4(23) + 1208.1$$

$$L(23) = \boxed{34,815.7 \text{ million}}$$

4. The weekly rate of change  $R$  of people who are aware of the promotion  $x$  weeks after it is introduced is described by the equation  $R(x) = 1200 - 30x$ .

3 a. What is the x-intercept?

$$0 = 1200 - 30x$$

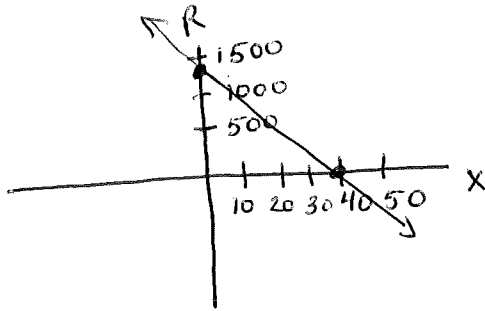
$$\begin{array}{r} +30x \qquad \qquad +30x \\ \hline 30x = 1200 \\ \frac{30x}{30} = \frac{1200}{30} \\ \boxed{x = 40} \end{array}$$

3 b. What is the R-intercept?

$$R = 1200 - 30(0)$$

$$\boxed{R = 1200}$$

- 3 c. Sketch the graph of this function in an appropriate viewing window. Label your scale on the x and R axis.



5. Write an equation of the line passing through the points  $(1, 3)$  and  $(4, -9)$ .

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$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-9 - 3}{4 - 1} = \frac{-12}{3} = -4$$

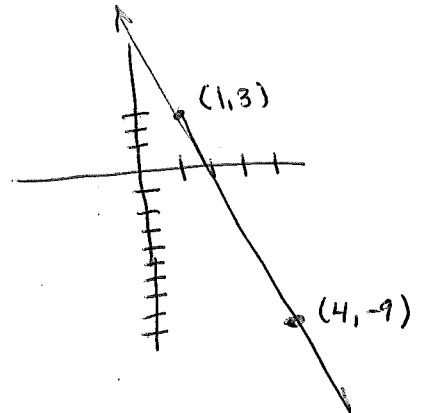
$$y - y_1 = m(x - x_1)$$

$$y - 3 = -4(x - 1)$$

$$y - 3 = -4x + 4$$

$$\begin{array}{r} +3 \qquad \qquad +3 \end{array}$$

$$\boxed{y = -4x + 7}$$



6. Find the difference quotient  $DQ = \frac{f(x+h)-f(x)}{h}$  for the function

(9)  $f(x) = 3x^2 - 5.$

$$DQ = \frac{3(x+h)^2 - 5 - (3x^2 - 5)}{h}$$

$$DQ = \frac{3(x^2 + xh + xh + h^2) - 5 - (3x^2 - 5)}{h}$$

$$DQ = \frac{\cancel{3x^2} + 6xh + 3h^2 - \cancel{5} - \cancel{3x^2} + \cancel{5}}{h} = \frac{6xh + 3h^2}{h}$$

$$DQ = 6x + 3h$$

7. Solve the equation  $\frac{x}{2} + \frac{1}{4} = \frac{1}{3}x - \frac{1}{6}$

(9)

$$\frac{1}{2}x + \frac{1}{4} = \frac{1}{3}x - \frac{1}{6}$$

$$-\frac{1}{3}x \quad -\frac{1}{4} \quad -\frac{1}{3}x \quad -\frac{1}{4}$$

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$$\frac{\frac{1}{6}x}{\frac{1}{6}} = \frac{-5}{\frac{1}{6}}$$

$$x = \frac{-5}{12} \cdot \frac{6}{1}$$

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

$$\frac{1}{2} - \frac{1}{3} = \frac{3}{6} - \frac{2}{6} = \frac{1}{6}$$

$$-\frac{1}{6} - \frac{1}{4} = \frac{-2}{12} - \frac{3}{12} = \frac{-5}{12}$$

OR  $12\left(\frac{x}{2} + \frac{1}{4}\right) = \left(\frac{x}{3} - \frac{1}{6}\right)12$

$$6x + 3 = 4x - 2$$

$$-4x - 3 \quad -4x - 3$$

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

$$x = -5/2$$

8. The table below shows the percent,  $p$ , of state workers living in Alpha County for selected years,  $t$ .

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10 ( )  
10 ( )

$-5.6$   
 $-14.8$

$$m = \frac{-5.6}{10} = -0.56$$

$$m = \frac{-14.8}{10} = -1.48$$

not the same slope so this is a scatterplot.  
Use Regression

- a. Write the linear equation that models the data in the table.

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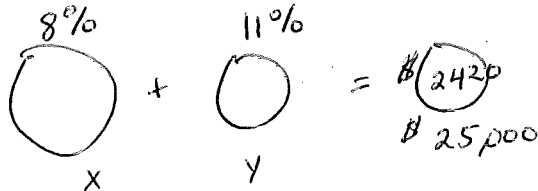
$$P = -1.03t + 2049.57$$

- b. Using your model, predict what percent of state workers there were in 1945.  $P(1945) = -1.03(1945) + 2049.57 = 46.22\%$

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9. Ms. Jones invested \$25,000 in two accounts, one yielding 8% and the other yielding 11%. If she received a total of \$2,420 in interest at the end of the year, how much did she invest in each account?

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$$\begin{cases} x + y = 25,000 \\ 0.08x + 0.11y = 2420 \end{cases}$$

OR use substitution or graphing.

elimination:

$$\begin{array}{r} -0.08x - 0.08y = -2000 \\ 0.08x + 0.11y = 2420 \\ \hline 0.03y = 420 \end{array}$$

$$\frac{0.03y = 420}{0.03} = \frac{420}{0.03}$$

$$\begin{array}{l} y = 14,000 \\ x = 11,000 \end{array}$$

10. Solve the following inequality. Draw a number line graph of the solution.

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$$\frac{3(x-2)}{7} \geq \frac{2x}{3} - 6$$

$$\frac{3x-6}{7} \geq \frac{2x-6}{3}$$

$$\frac{-2x + \frac{6}{7}}{\frac{3}{3}x + \frac{6}{7}}$$

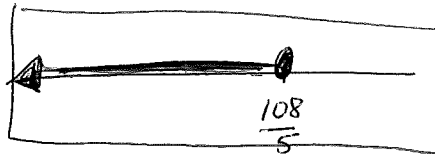
$$\frac{-5}{21}x \geq \frac{-36}{7}$$

Flip!

$$\frac{-5}{21}$$

$$x \leq \frac{-36}{7} \cdot \frac{21}{-5}$$

$$x \leq \frac{108}{5}$$



$$\frac{3}{7} - \frac{2}{3} = \frac{9}{21} - \frac{14}{21} = \frac{-5}{21}$$

$$\frac{-6}{1} + \frac{6}{7} = \frac{-42}{7} + \frac{6}{7} = \frac{-36}{7}$$

11. The median salary (in thousands) of a group of people S is related to the median salary of another group of people N by  $S(N) = 0.942N - 1.174$ .

Find the median salary of the people in group N if the median salary of group S is more than \$32,738.

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$$32,738 = 32.738 \text{ thousands}$$

$$0.942N - 1.174 > 32.738$$

$$+1.174 \quad +1.174$$

$$\frac{0.942N}{0.942} > \frac{33.912}{0.942}$$

$$N > 36$$

more than 36 thousand dollars