

Section 1.1

3.) $a = \sqrt{10^2 + 0^2} = 10$, $b = 3$, $c = \sqrt{10^2 + 3^2} = \sqrt{109}$ and
 $a^2 + b^2 = 10^2 + 3^2 = 109 = (\sqrt{109})^2 = c^2$.

4.) $a = 4$, $b = 7$, $c = \sqrt{4^2 + 7^2} = \sqrt{65}$ and
 $a^2 + b^2 = 4^2 + 7^2 = 65 = (\sqrt{65})^2 = c^2$.

10.) $D = \sqrt{\left(\frac{5}{6} - \frac{2}{3}\right)^2 + \left(1 - \left(-\frac{1}{3}\right)\right)^2} = \sqrt{\frac{1}{36} + \frac{16}{9}} = \sqrt{\frac{65}{36}} = \frac{\sqrt{65}}{6}$

midpt. = $\left(\frac{\frac{2}{3} + \frac{5}{6}}{2}, \frac{-\frac{1}{3} + 1}{2}\right) = \left(\frac{3}{4}, \frac{1}{3}\right)$

13.) $D = \sqrt{(1 - (-1))^2 + (\sqrt{3} - 1)^2} = \sqrt{8 - 2\sqrt{3}}$

midpt. = $\left(\frac{1 + (-1)}{2}, \frac{\sqrt{3} + 1}{2}\right) = \left(0, \frac{\sqrt{3} + 1}{2}\right)$

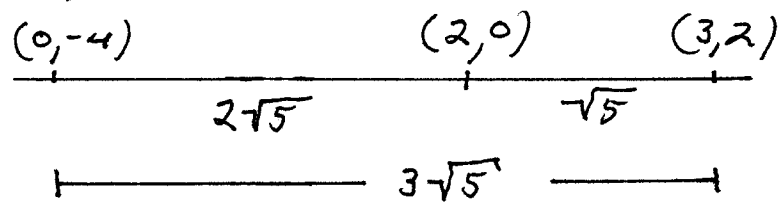
14.) $D = \sqrt{(-2 - 0)^2 + (0 - \sqrt{2})^2} = \sqrt{6}$

midpt. = $\left(\frac{-2 + 0}{2}, \frac{0 + \sqrt{2}}{2}\right) = \left(-1, \frac{\sqrt{2}}{2}\right)$

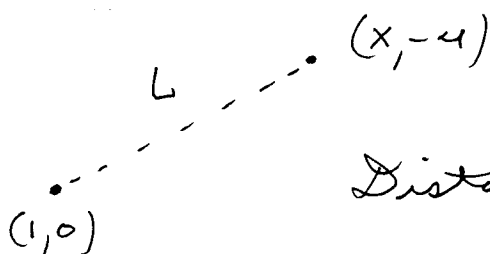
15.) $(0, 1), (3, 7)$: $D = \sqrt{9 + 36} = \sqrt{45} = 3\sqrt{5} = a$
 $(0, 1), (4, -1)$: $D = \sqrt{16 + 4} = \sqrt{20} = 2\sqrt{5} = b$
 $(3, 7), (4, -1)$: $D = \sqrt{1 + 64} = \sqrt{65} = c$
 $a^2 + b^2 = 45 + 20 = 65 = c^2$ so Δ is right.

16.) $(1, -3), (3, 2)$: $D = \sqrt{4 + 25} = \sqrt{29}$ } so Δ is
 $(3, 2), (-2, 4)$: $D = \sqrt{25 + 4} = \sqrt{29}$ } isosceles.

19.) $(0, -4), (2, 0): D = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$,
 $(2, 0), (3, 2): D = \sqrt{1+4} = \sqrt{5}$
 $(0, -4), (3, 2): D = \sqrt{9+36} = \sqrt{45} = 3\sqrt{5}$

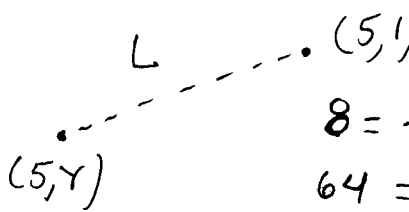


so points ARE collinear

23.)  Distance $L=5$ means

$$5 = \sqrt{(x-1)^2 + (-4-0)^2} \rightarrow 25 = (x-1)^2 + 16 \rightarrow (x-1)^2 = 9$$

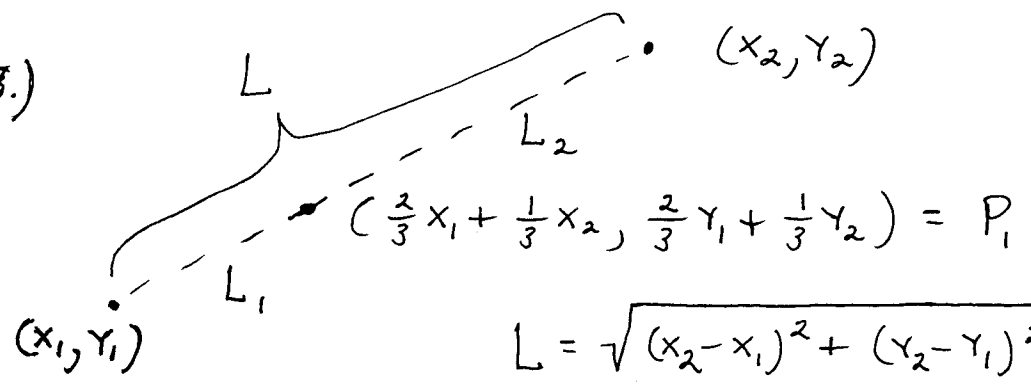
$$\rightarrow x-1 = 3 \text{ or } x-1 = -3 \rightarrow \boxed{x=4} \text{ or } \boxed{x=-2}$$

26.)  Distance $L=8$ means

$$8 = \sqrt{(5-5)^2 + (Y-1)^2} \rightarrow$$

$$64 = 0 + (Y-1)^2 \rightarrow$$

$$Y-1 = 8 \text{ or } Y-1 = -8 \rightarrow \boxed{Y=9} \text{ or } \boxed{Y=-7}$$

28.) 

$$L = \sqrt{(x_2 - x_1)^2 + (Y_2 - Y_1)^2}$$

$$\begin{aligned}
 L_1 &= \sqrt{\left[\left(\frac{2}{3}x_1 + \frac{1}{3}x_2\right) - x_1\right]^2 + \left[\left(\frac{2}{3}y_1 + \frac{1}{3}y_2\right) - y_1\right]^2} \\
 &= \sqrt{\left(\frac{1}{3}x_2 - \frac{1}{3}x_1\right)^2 + \left(\frac{1}{3}y_2 - \frac{1}{3}y_1\right)^2} \\
 &= \sqrt{\left(\frac{1}{3}\right)^2 (x_2 - x_1)^2 + \left(\frac{1}{3}\right)^2 (y_2 - y_1)^2} \\
 &= \frac{1}{3} \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \frac{1}{3} L \quad ;
 \end{aligned}$$

$$\begin{aligned}
 L_2 &= \sqrt{\left[x_2 - \left(\frac{2}{3}x_1 + \frac{1}{3}x_2\right)\right]^2 + \left[y_2 - \left(\frac{2}{3}y_1 + \frac{1}{3}y_2\right)\right]^2} \\
 &= \sqrt{\left(\frac{2}{3}x_2 - \frac{2}{3}x_1\right)^2 + \left(\frac{2}{3}y_2 - \frac{2}{3}y_1\right)^2}
 \end{aligned}$$

$$= \sqrt{\left(\frac{2}{3}\right)^2 (x_2 - x_1)^2 + \left(\frac{2}{3}\right)^2 (y_2 - y_1)^2}$$

$$= \frac{2}{3} \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \frac{2}{3} L \quad \text{so}$$

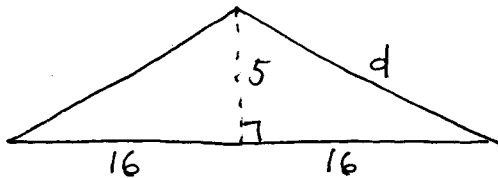
point P_1 is a point of trisection ; the other point of trisection is the midpoint of the segment joining the points

$\left(\frac{2}{3}x_1 + \frac{1}{3}x_2, \frac{2}{3}y_1 + \frac{1}{3}y_2\right)$ and (x_2, y_2) :

$$\text{point is } \left(\frac{\left(\frac{2}{3}x_1 + \frac{1}{3}x_2\right) + x_2}{2}, \frac{\left(\frac{2}{3}y_1 + \frac{1}{3}y_2\right) + y_2}{2}\right)$$

$$= \left(\frac{\frac{2}{3}x_1 + \frac{4}{3}x_2}{2}, \frac{\frac{2}{3}y_1 + \frac{4}{3}y_2}{2}\right) = \left(\frac{1}{3}x_1 + \frac{2}{3}x_2, \frac{1}{3}y_1 + \frac{2}{3}y_2\right).$$

31.)

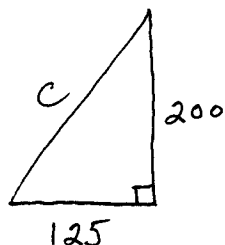


a.) $d^2 = 5^2 + 16^2 = 281$ so
 $d = \sqrt{281} \approx 16.76$ ft.

b.) area of roof is

$$(2)(16)(5) = 80 \sqrt{281} \approx 1341 \text{ ft}^2$$

32.)



$$c^2 = 125^2 + 200^2 \rightarrow$$

$$c^2 = 55,625 \rightarrow$$

$$c = \sqrt{55,625} \approx 235.85 \text{ ft.}$$

35.) a.) 10,350

b.) 8900

c.) 8500

d.) 10,500

36.) a.) April 2002 \approx 10,350 and Nov. 2002 \approx 8550

so % change is $\frac{8550 - 10,350}{10,350} \approx -0.174 = -17.4\%$
 (decrease)

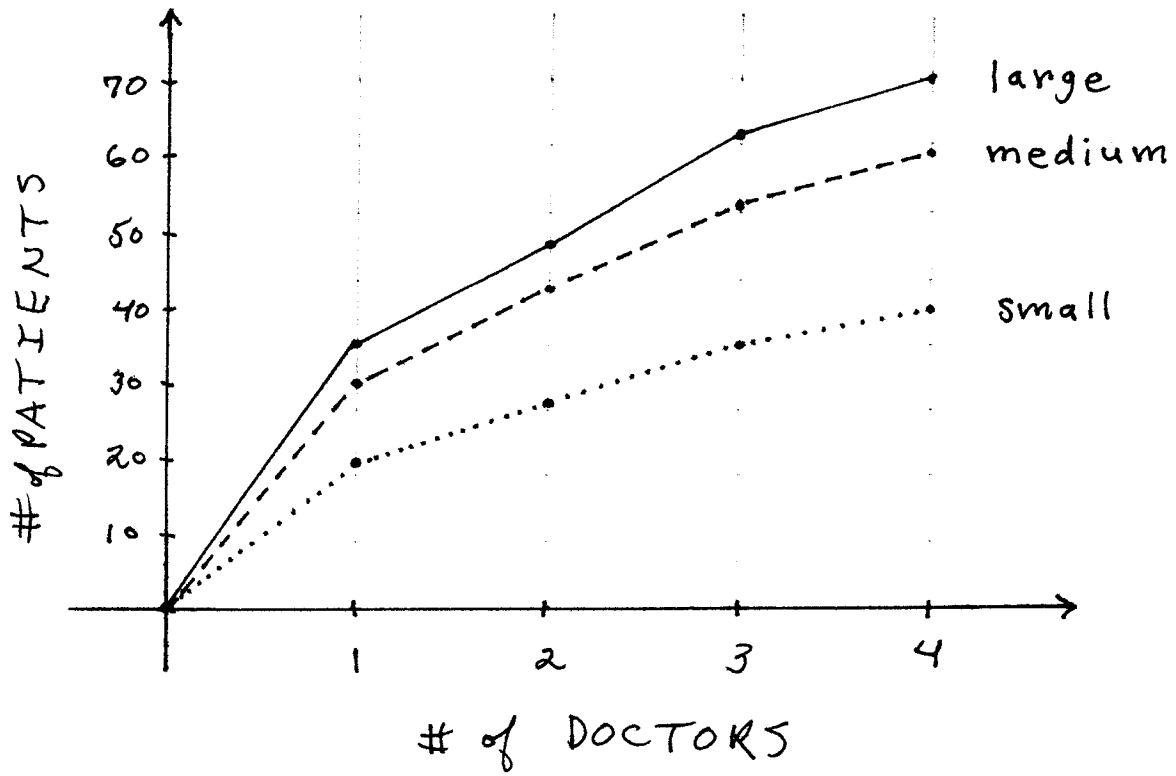
b.) June 2003 \approx 8850 and Feb. 2004 \approx 10,700

so % change is $\frac{10,700 - 8850}{8850} \approx 0.209 = +20.9\%$
 (increase)

41.)

pt. $(-1, -2)$ is moved to $(-1+2, -2+3) = (1, 1)$,pt. $(-3, -1)$ is moved to $(-3+2, -1+3) = (-1, 2)$,pt. $(0, 0)$ is moved to $(0+2, 0+3) = (2, 3)$.

43.) a.)

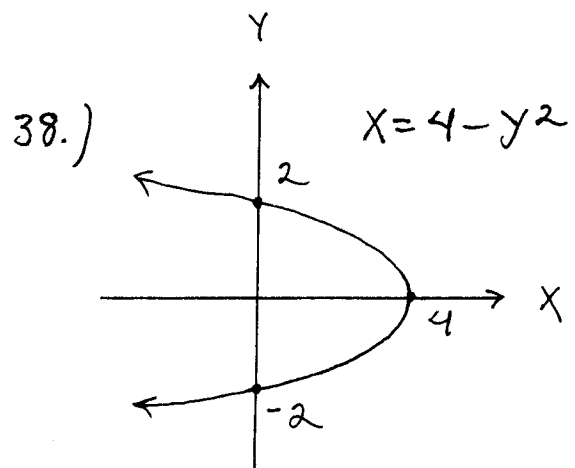
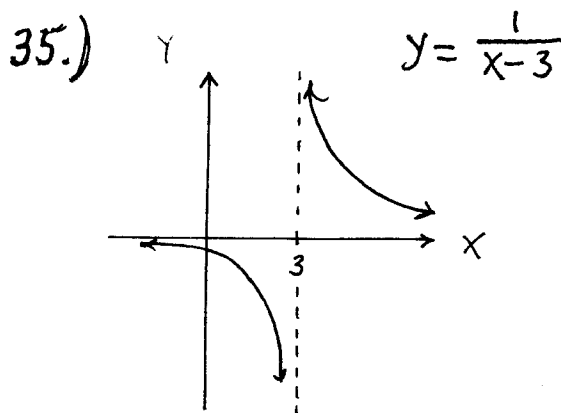
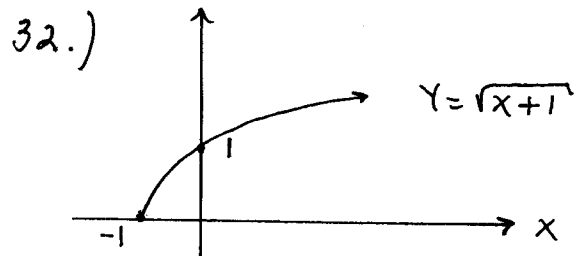
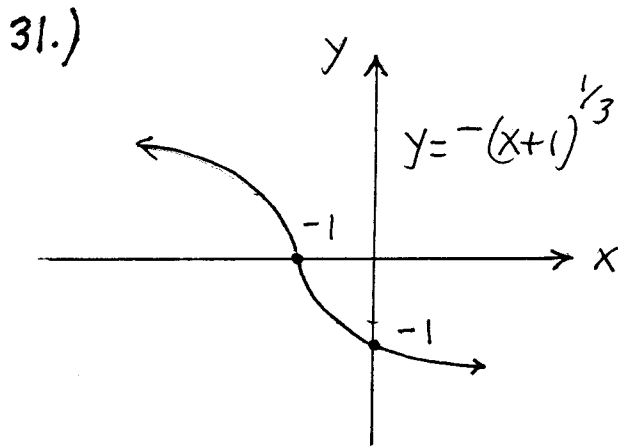
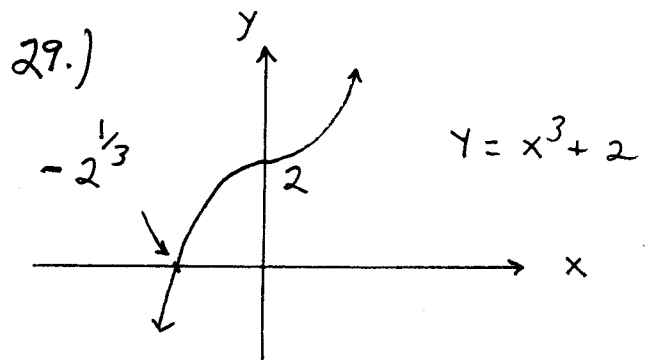
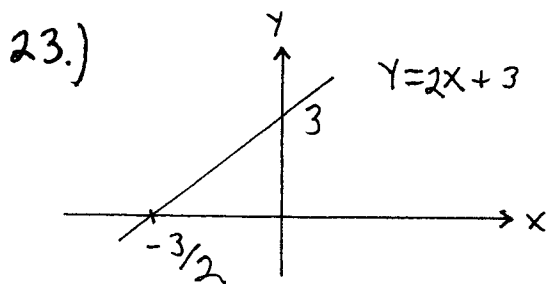


20.) $y = \frac{x^2 + 3x}{(3x+1)^2} \rightarrow$

x-int.: $y=0 \rightarrow 0 = \frac{x^2 + 3x}{(3x+1)^2} \rightarrow x^2 + 3x = 0 \rightarrow$

$x(x+3) = 0 \rightarrow x=0, x=-3$;

y-int.: $x=0 \rightarrow y = \frac{0}{1^2} = 0 \rightarrow y=0$



$$41.) \quad (x-2)^2 + (y-(-1))^2 = 4^2 \rightarrow$$

$$(x-2)^2 + (y+1)^2 = 16.$$

$$44.) \quad (x-3)^2 + (y-(-2))^2 = r^2 \text{ and } x=-1, y=1 \rightarrow$$

$$16 + 9 = r^2 \rightarrow r = 5 \text{ and } (x-3)^2 + (y+2)^2 = 25$$

$$46.) \quad (-4, -1) \text{ and } (4, 1) : \text{midpt. } \left(\frac{-4+4}{2}, \frac{-1+1}{2}\right) = (0, 0)$$

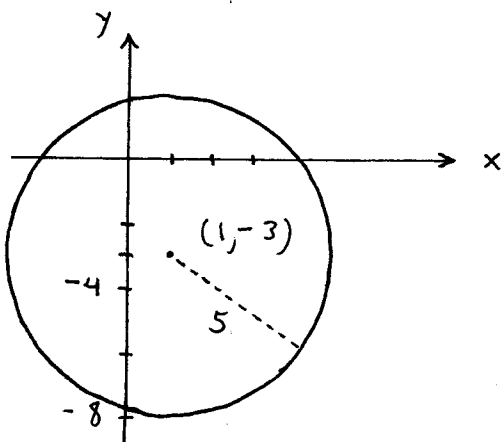
is center ; diameter $\sqrt{(4-(-4))^2 + (1-(-1))^2} = \sqrt{68} = 2\sqrt{17}$
 so radius $r = \sqrt{17}$, then circle is
 $(x-0)^2 + (y-0)^2 = (\sqrt{17})^2$ or $x^2 + y^2 = 17$.

$$48.) \quad x^2 + y^2 - 2x + 6y - 15 = 0 \rightarrow (x^2 - 2x) + (y^2 + 6y) = 15$$

$$\rightarrow (x^2 - 2x + 1) + (y^2 + 6y + 9) = 15 + 1 + 9 \rightarrow$$

$$(x-1)^2 + (y+3)^2 = 5^2 \rightarrow \text{center: } (1, -3)$$

radius: 5



$$53.) 16x^2 + 16y^2 + 16x + 40y - 7 = 0 \rightarrow$$

$$(16x^2 + 16x) + (16y^2 + 40y) = 7 \rightarrow$$

$$16(x^2 + x) + 16(y^2 + \frac{5}{2}y) = 7 \rightarrow$$

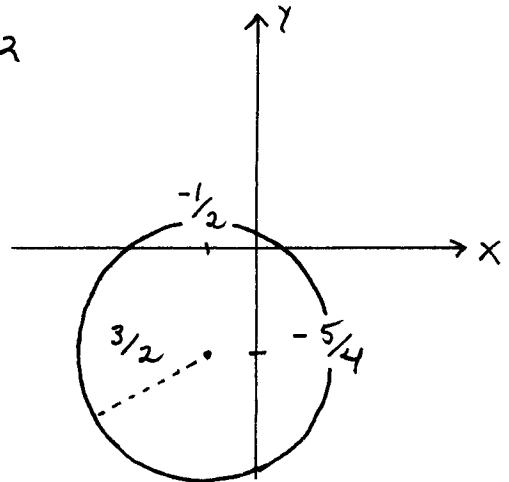
$$(x^2 + x) + (y^2 + \frac{5}{2}y) = \frac{7}{16} \rightarrow$$

$$(x^2 + x + \frac{1}{4}) + (y^2 + \frac{5}{2}y + \frac{25}{16}) = \frac{7}{16} + \frac{1}{4} + \frac{25}{16} \rightarrow$$

$$(x + \frac{1}{2})^2 + (y + \frac{5}{4})^2 = \frac{36}{16} = \frac{9}{4} = (\frac{3}{2})^2$$

$$\rightarrow \text{center: } (-\frac{1}{2}, -\frac{5}{4})$$

$$\text{radius: } \frac{3}{2}$$

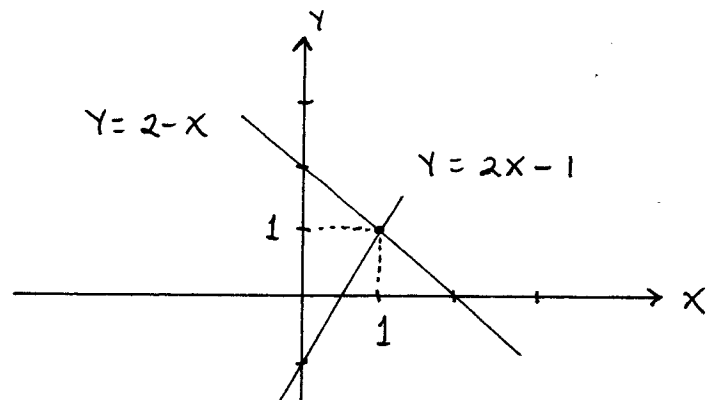


55.)

$$\left. \begin{array}{l} y = 2 - x \\ y = 2x - 1 \end{array} \right\} \rightarrow$$

$$2 - x = 2x - 1 \rightarrow 3 = 3x \rightarrow$$

$$\boxed{x=1} \text{ and } \boxed{y=1}$$



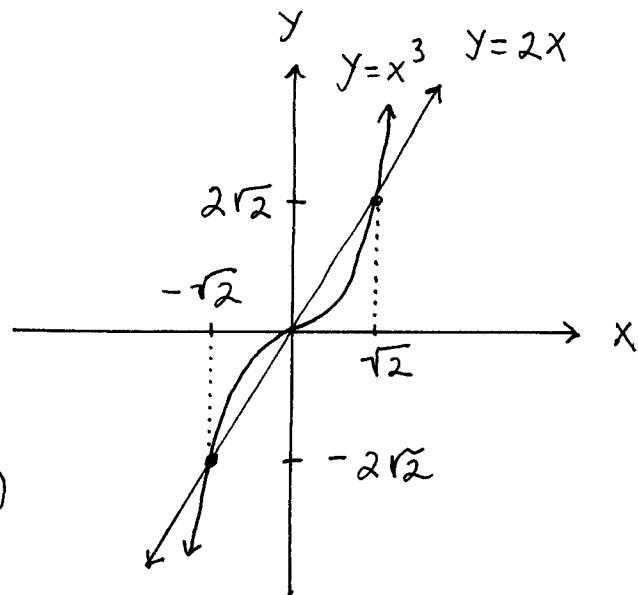
$$59.) \left. \begin{array}{l} y = x^3 \\ y = 2x \end{array} \right\} \rightarrow x^3 = 2x$$

$$\rightarrow x^3 - 2x = 0$$

$$\rightarrow x(x^2 - 2) = 0$$

$$\rightarrow x(x - \sqrt{2})(x + \sqrt{2}) = 0$$

$$\begin{array}{l} \downarrow \qquad \qquad \qquad \downarrow \qquad \qquad \qquad \downarrow \\ \boxed{x = -\sqrt{2}, y = -2\sqrt{2}} \\ \boxed{x = \sqrt{2}, y = 2\sqrt{2}} \\ \boxed{x = 0, y = 0} \end{array}$$



$$60.) \left. \begin{array}{l} y = \sqrt{x} \\ y = x \end{array} \right\}$$

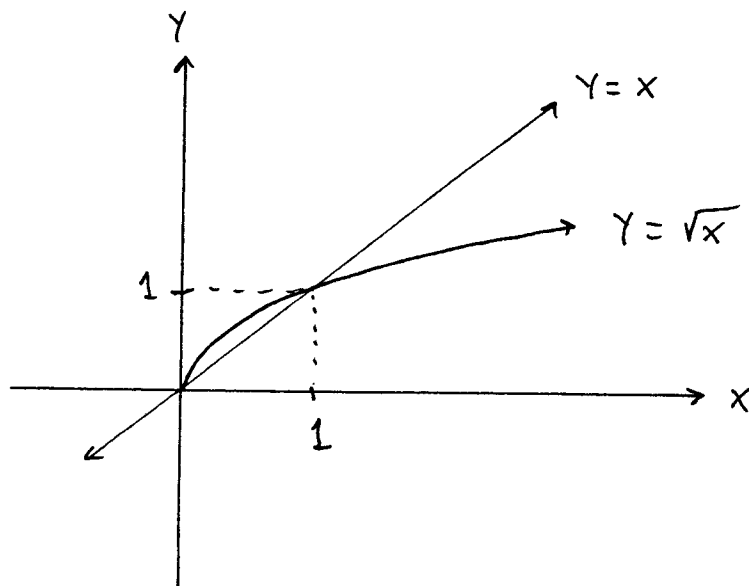
$$\sqrt{x} = x \rightarrow$$

$$\sqrt{x} - x = 0 \rightarrow$$

$$\sqrt{x}(1 - \sqrt{x}) = 0 \rightarrow$$

$$\downarrow \qquad \qquad \qquad \downarrow \\ x = 1, y = 1$$

$$x = 0, y = 0$$



$$62.) \left. \begin{array}{l} y = x^3 - 2x^2 + x - 1 \\ y = -x^2 + 3x - 1 \end{array} \right\} \rightarrow x^3 - 2x^2 + x - 1 = -x^2 + 3x - 1 \rightarrow$$

$$x^3 - x^2 - 2x = 0 \rightarrow x(x^2 - x - 2) = 0 \rightarrow$$

$$x(x-2)(x+1) = 0 \rightarrow x = 0, x = 2, x = -1 \text{ then}$$

points of intersection are

$$x=0, y=-1$$

$$x=2, y=1 \quad \text{and}$$

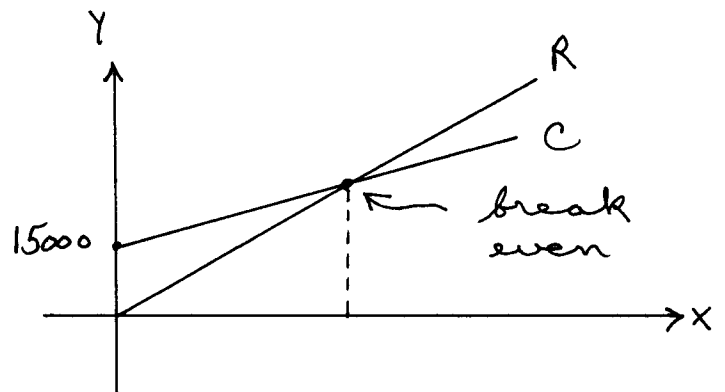
$$x=-1, y=-5$$

63.) x : number of products

(a) cost $C = 15,000 + 11.8x$

revenue $R = 19.3x$

(b) $C = 15,000 + 11.8x$
 $R = 19.3x$ } \rightarrow



$$15,000 + 11.8x = 19.3x \rightarrow$$

$$15,000 = 7.5x \rightarrow x = 2000 \text{ products}$$

(c) profit $P = R - C \rightarrow$

$$P = 19.3x - (15,000 + 11.8x) = 7.5x - 15,000 ; \text{ if } P = \$1000$$

then $1000 = 7.5x - 15,000 \rightarrow 16000 = 7.5x \rightarrow$

$$x \approx 2134 \text{ products}$$

66.)
$$\left. \begin{array}{l} C = 6X + 500,000 \\ R = 35X \end{array} \right\} \text{break even} \rightarrow C = R$$

$$\rightarrow 6X + 500,000 = 35X \rightarrow 500,000 = 29X \rightarrow$$

$$X = 17,242 \text{ items}$$

