## Section 0.2

$m = \frac{y_2 - y_1}{x_2 - x_1}$ $\qquad y = mx + b \qquad y - y_1 = m(x - x_1)$

1a. $(0,3)(4,0)$

$m = \frac{0-3}{4-0} = $

$m = \frac{-3}{4}$

1b. $(0,1)(4,3)$

$m = \frac{3-1}{4-0} = \frac{2}{4} =$

$m = \frac{1}{2}$

1c. $(0,1)(4,1)$

$m = \frac{1-1}{4-0} = \frac{0}{4}$

$m = 0$

1d. $(0,-1)(1,1)$

$m = \frac{1-(-1)}{1-0} = \frac{1+1}{1-0} = \frac{2}{1} =$

$m = 2$

1e. $(0,0)(0,3)$

$m = \frac{3-0}{0-0} = \frac{3}{0} =$

m = under

3a. $(2,4)(5,8)$

$m = \frac{8-4}{5-2} =$

$m = \frac{4}{3}$

3b. $(-2,4)(3,-5)$

$m = \frac{-5-4}{3-(-2)} = \frac{-9}{3+2} =$

$m = \frac{-9}{5}$

3c. $(2,4)(x,x^2)$

$m = \frac{x^2-4}{x-2} = \frac{(x+2)\cancel{(x-2)}}{\cancel{(x-2)}} =$

Check Domain

$x - 2 = 0$
$+2 \quad +2$
$x = 2$

$\boxed{m = x+2, x \neq 2}$

3d. $(2,5)(2+h, 1+(2+h)^2)$

$m = \frac{(1+(2+h)^2)-5}{2+h-2}$

$m = \frac{1-5+(2+h)^2}{2-2+h}$

$m = \frac{-4+(2+h)^2}{h}$

$\frac{-4+(2+h)(2+h)}{h}$

$\frac{-4+4+2h+2h+h^2}{h} = \frac{0+4h+h^2}{h} = \frac{h^2+4h}{h} = \frac{\cancel{h}(h+4)}{\cancel{h}}$

$\boxed{m = h+4}$

b. $(0,0)\ (t \cdot 300ft, 5000)$

$(0,0)\ (300t, 5000)$

$$m = \frac{5000 - 0}{300t - 0}$$

$$= $$

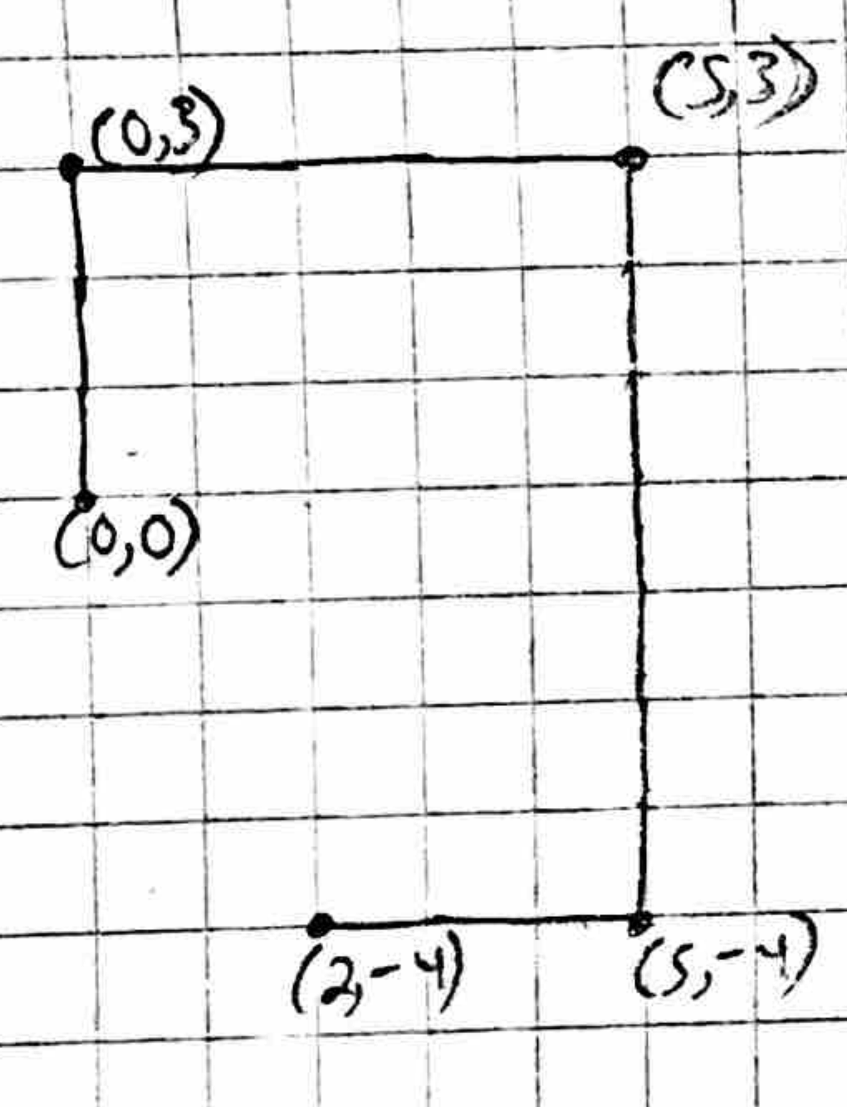
$$m = \frac{5000}{300t}, \quad t > 0$$

c. Decreasing

7.

$a^2 + b^2 = c^2$

$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$




$\overset{x_1}{(0},\overset{y_1}{0)}\ \overset{x_2}{(2},\overset{y_2}{-4)}$

$$D = \sqrt{(2-0)^2 + (-4-0)^2}$$

$$= \sqrt{(2)^2 + (-4)^2}$$

$$= \sqrt{4 + 16}$$

$$= \sqrt{20}$$

$$\approx$$

4.47 blocks

3e. $(x, x^2+3)\ (a, a^2+3)$

$$m = \frac{(a^2+3) - (x^2+3)}{a-x}$$

$$= \frac{a^2+3-x^2-3}{a-x}$$

$$= \frac{a^2-x^2}{a-x}$$

$$= \frac{(a+x)\cancel{(a-x)}}{\cancel{a-x}}$$

$$\boxed{m = a+x}$$

5. $(0,0)$ ← my telescope

~~After~~ 5 seconds

5a. $(0,0)(5 \cdot 300\text{ft}, 5000)$

$= (0,0)(1500, 5000)$

$$m = \frac{5000-0}{1500-0}$$

$$= \frac{50\cancel{00}}{15\cancel{00}}$$

$$m = \frac{10}{3}$$

~~After~~ 10 seconds

$(0,0)(10 \cdot 300\text{ft}, 5000)$

$(0,0)(3000, 5000)$

$$m = \frac{5000-0}{3000-0}$$

$$= \frac{5\cancel{000}}{3\cancel{000}}$$

$$m = \frac{5}{3}$$

~~After~~ 20 seconds

$(0,0)(20 \cdot 300\text{ft}, 5000)$

$(0,0)(6000, 5000)$

$$m = \frac{5000-0}{6000-0}$$

$$= \frac{5\cancel{000}}{6\cancel{000}}$$

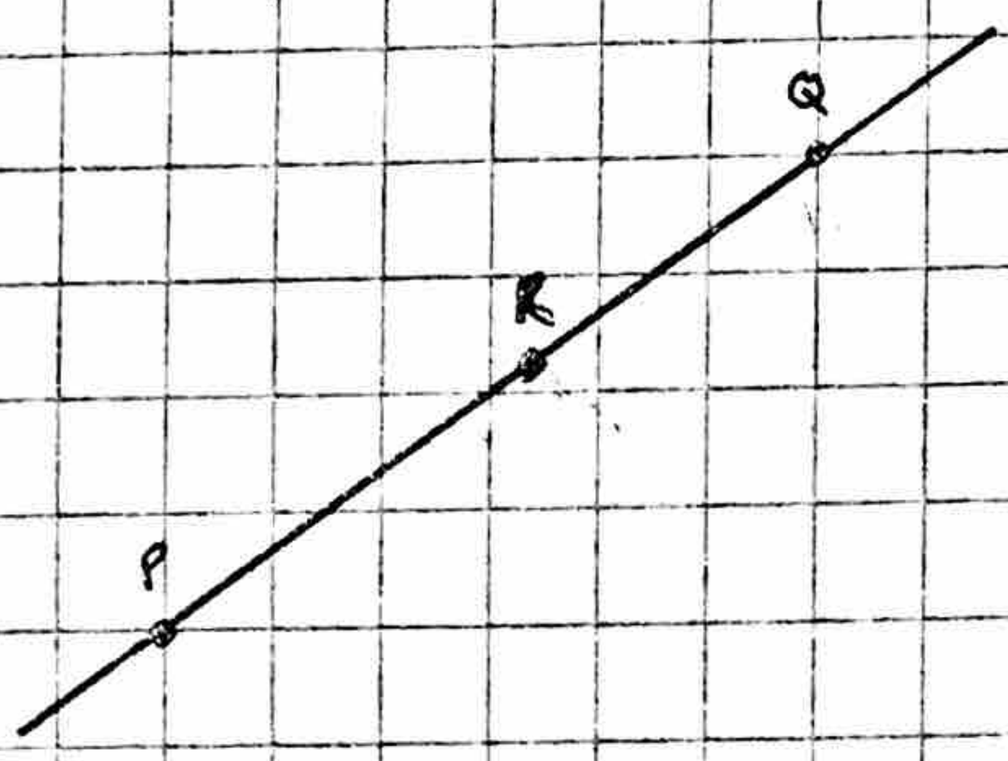
$$m = \frac{5}{6}$$

11a. $P = (2,3)$ $\quad Q = (8,11)$ $\quad R = (x,y)$, $x = 2a + 8(1-a)$

$y = 3a + 11(1-a)$

$0 \leq a \leq 1$

Verify R is on PQ




Slope of PQ $\quad m = \dfrac{11-3}{8-2}$

$m = \dfrac{8}{6}$

Equation for PQ $\quad y - y_1 = m(x - x_1)$

$$\boxed{y - 3 = \frac{8}{6}(x-2)}$$

Bring equation in terms of x and y to validate R

$6(y-3) = \cancel{6} \cdot \dfrac{8}{\cancel{6}}(x-2)$

$6(y-3) = 8(x-2)$

$6y - 18 = 8x - 16$

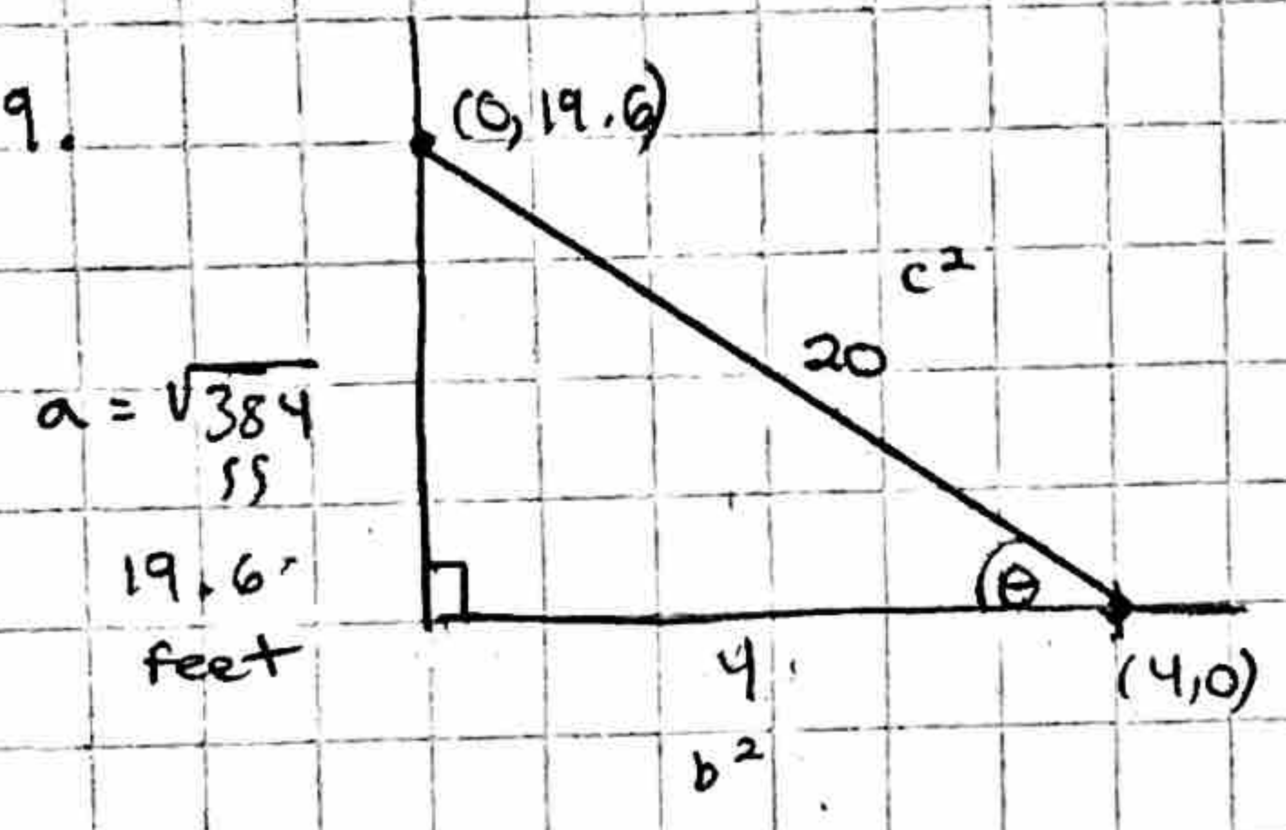
$-8x \quad\quad -8x$

$6y - 8x - 18 = -16$

$+18 \quad\quad +18$

$$\boxed{6y - 8x = 2}$$

9.




9a. $a^2 + b^2 = c^2$

$a^2 + 4^2 = 20^2$

$a^2 + 16 = 400$

$-16 \quad -16$

$\sqrt{a^2} = \sqrt{384}$

$\boxed{a = \sqrt{384} \approx 19.6 \text{ feet}}$

9b. $(4,0)\ (0, \sqrt{384})$

$m = \dfrac{\sqrt{384} - 0}{0 - 4} = \dfrac{\sqrt{384}}{-4} \approx$

$\boxed{m = -4.9}$

9c. $\tan\theta = \dfrac{\sqrt{384}}{4} \approx 4.9$

$$\boxed{\begin{array}{c}\tan^{-1}(4.9) \approx 78.5^\circ \\ \theta = 78.5^\circ\end{array}}$$

Validate Point R to see if it is on line PQ

$R = (x, y)$, $x = 2a + 8(1-a)$

$y = 3a + 11(1-a)$

where $0 \leq a \leq 1$

$$x = 2a + 8(1-a)$$
$$= 2a + 8 - 8a$$
$$= \boxed{x = 8 - 6a}$$

$$y = 3a + 11(1-a)$$
$$= 3a + 11 - 11a$$
$$= \boxed{y = 11 - 8a}$$

Plug in R x,y points into PQ Equation

$$6y - 8x = 2$$

$$6(11 - 8a) - 8(8 - 6a) = 2$$
$$= 66 - 48a - 64 + 48a = 2$$
$$= 2 - 0 = 2$$
$$= \boxed{2 = 2, \text{ for all } a \text{ values}}$$

This validates point R is on PQ

11b. Verify the distance between P and R equals (1-a) times the distance between P and Q.

$$D = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$, where D is Distance

dist (P, R)

P = (2,3) R = (x,y)

$x = 2a + 8(1-a) = 8 - 6a$

$y = 3a + 11(1-a) = 11 - 8a$

$$D = \sqrt{((8-6a)-2)^2 + ((11-8a)-3)^2}$$

$$D = \sqrt{(8-6a-2)^2 + (11-8a-3)^2}$$

$$D = \sqrt{(6-6a)^2 + (8-8a)^2}$$

$$D = \sqrt{6^2 \cdot (1-a)^2 + 8^2 \cdot (1-a)^2}$$

$$D = \sqrt{36(1-a)^2 + 64(1-a)^2}$$

$$D = \sqrt{100(1-a)^2}$$

$$\boxed{D = 10(1-a) \text{ or } 10 \cdot |1-a|}$$

(1-a) · dist (P, Q)

P = (2,3) Q = (8,11)

$$(1-a) \cdot \sqrt{(8-2)^2 + (11-3)^2}$$

$$= (1-a) \cdot \sqrt{(6)^2 + (8)^2}$$

$$= (1-a) \cdot \sqrt{36 + 64}$$

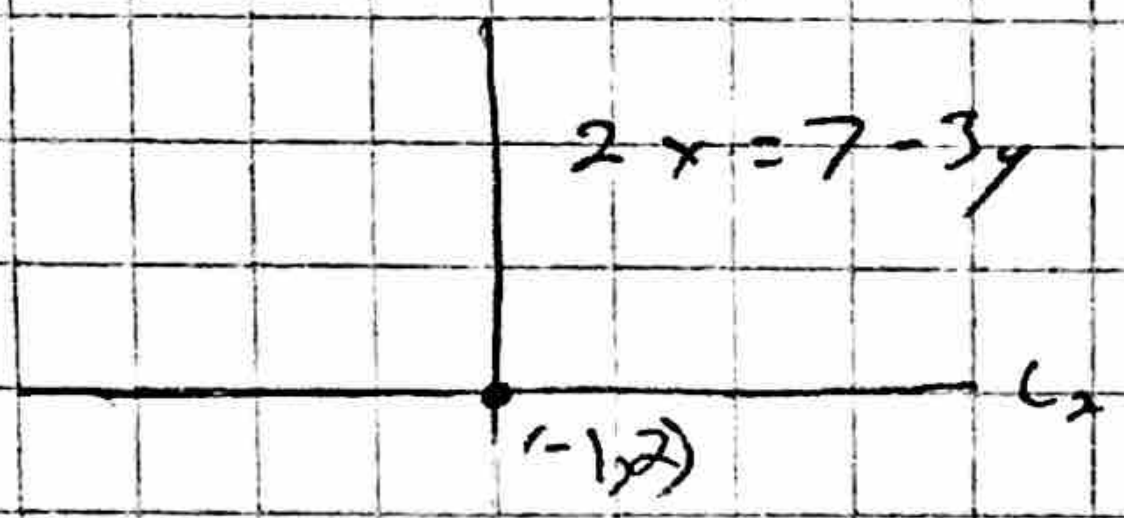
$$= (1-a) \cdot \sqrt{100}$$

$$= (1-a) \cdot 10$$

$$= \boxed{D = 10(1-a) \text{ or } 10 \cdot |1-a|}$$

$$\boxed{\text{dist}(P,R) = (1-a) \cdot \text{dist}(P,Q)}$$

17b.




$$2x = 7 - 3y$$
$$-7 \quad -7$$

$$\frac{2x - 7}{-3} = \frac{-3y}{-3}$$

$$-\frac{2}{3}x + \frac{7}{3} = y$$

$$y = -\frac{2}{3}x + \frac{7}{3}$$

$m = -\frac{3}{2}x$, $P(1,2)$

$$y - 2 = -\frac{3}{2}(x - 1)$$

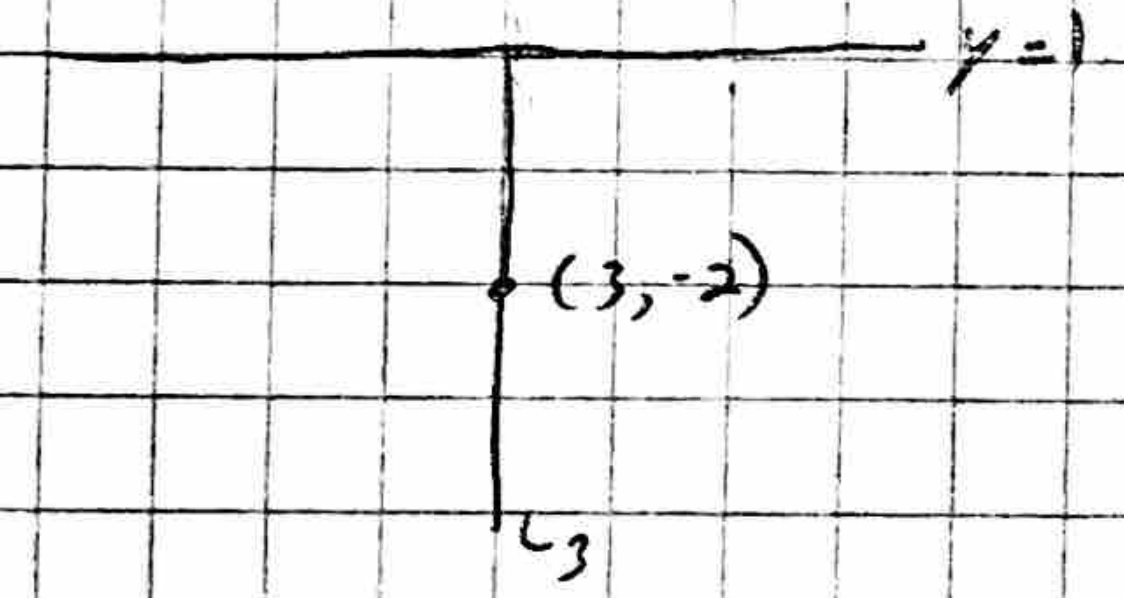
$$-\frac{3}{2}x \quad -\frac{3}{2}(-1)$$

$$y - 2 = -\frac{3}{2}x + \frac{3}{2}$$
$$+2 \qquad\qquad +2$$

$$y = -\frac{3}{2}x + \frac{7}{2}$$

$$\boxed{y = -\frac{3}{2}x + \frac{7}{2}}$$

17c.




$m = \frac{1}{0}$, $P(3,-2)$

$$y - (-2) = \frac{1}{0}(x - 3)$$

$y + 2$ = undef

$$\boxed{x = 3}$$

$y = mx + b$ or $y - y_1 = m(x - x_1)$

15a. $m = 3$, $P = (2, 5)$

$y - 5 = 3(x - 2)$

$y - 5 = 3x - 6$

$\quad +5 \qquad +5$

$y = 3x - 1$

15b. $m = -2/3$, $P = (3, 2)$

$y - 2 = \frac{-2}{3}(x - 3)$

$-\frac{2}{3}x \cdot -\frac{2}{\cancel{3}}(-\cancel{3})$

$y - 2 = -\frac{2}{3}x + 2$

$\quad +2 \qquad + 2$

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

15c. $m = -\frac{1}{2}$, $P = (1, 4)$

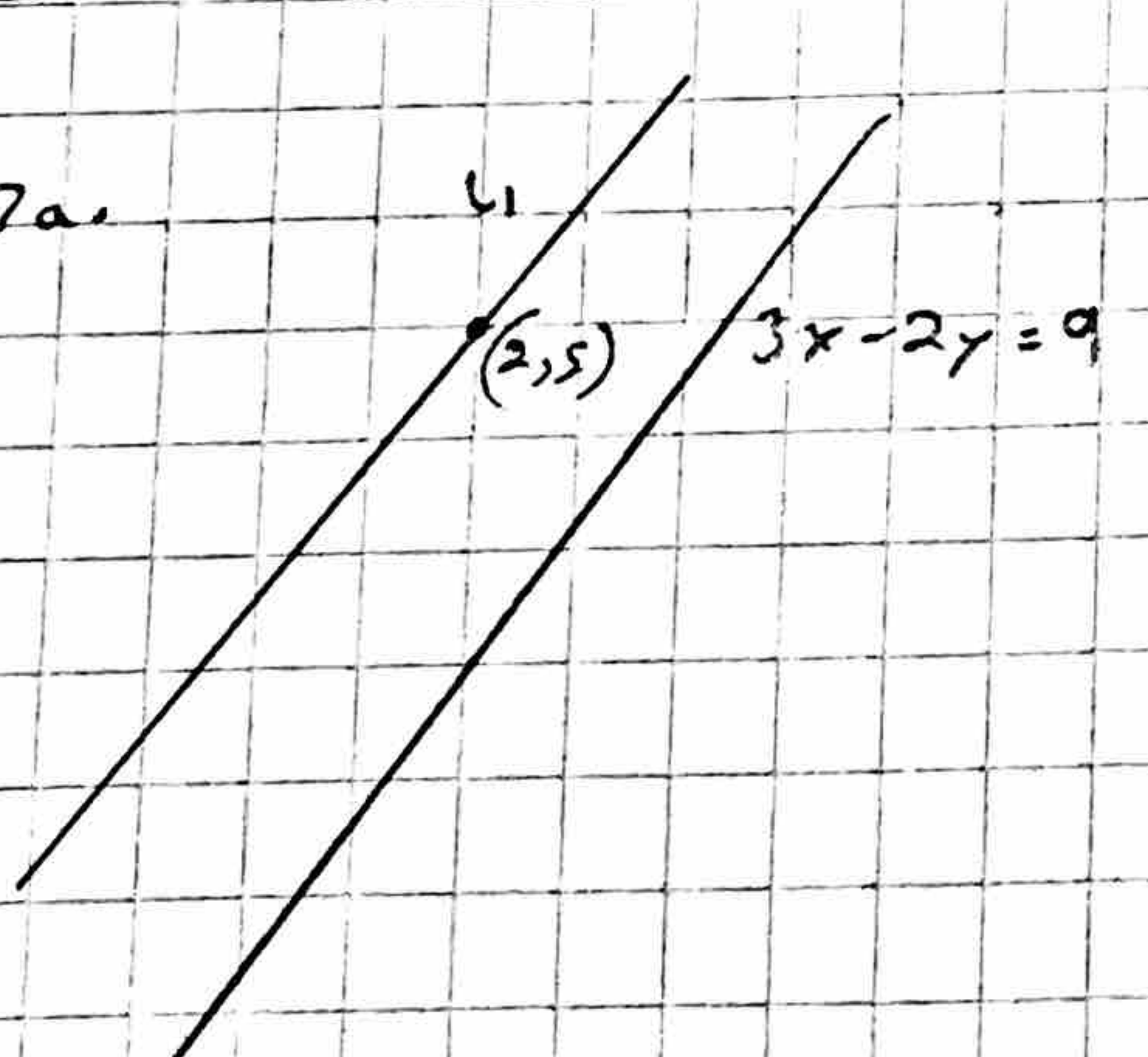
$y - 4 = -\frac{1}{2}(x - 1)$

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

$\quad +4 \qquad + 4$

$y = -\frac{1}{2}x + \frac{9}{2}$

17a.




$3x - 2y = 9$

$-3x \qquad -3x$

$\frac{-2y}{-2} = \frac{-3x}{-2} + \frac{9}{-2}$

$y = \frac{3}{2}x - \frac{9}{2}$ $\qquad m = \frac{3}{2}$

$m = 3/2$, $P(2, 5)$

$y - 5 = \frac{3}{2}(x - 2)$

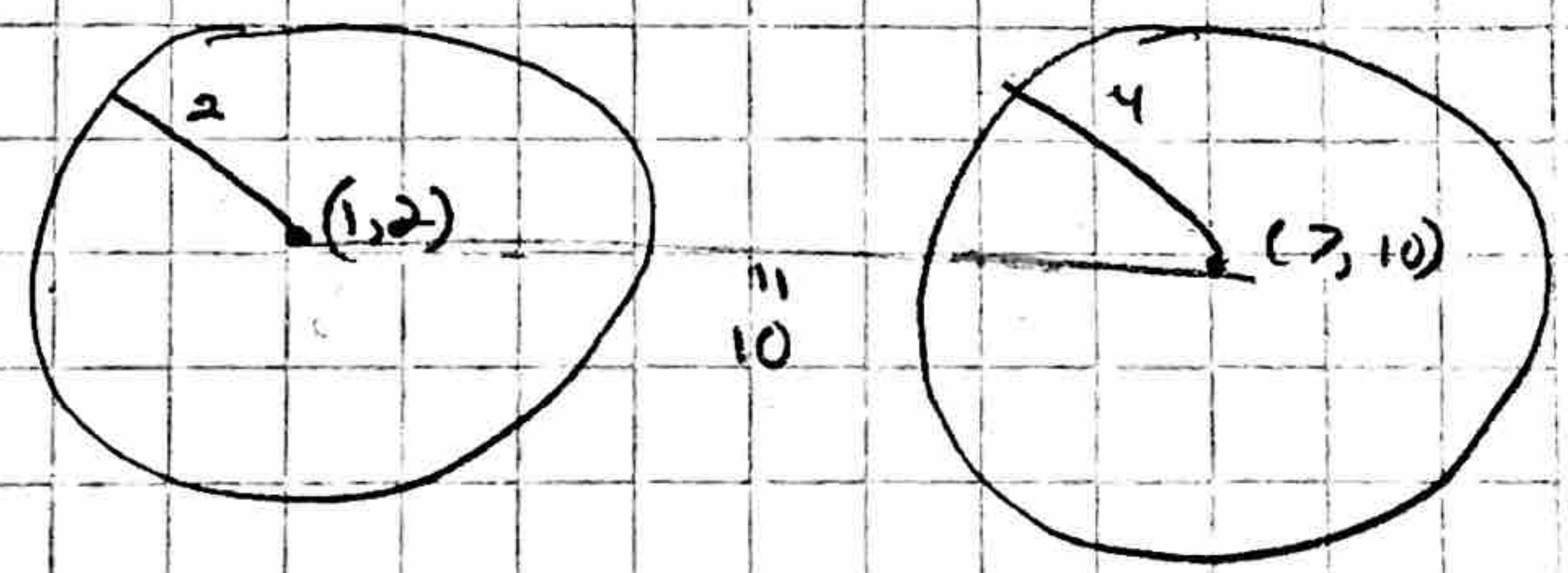
$y - 5 = \frac{3}{2}x \cdot \frac{3}{\cancel{2}}(-\cancel{2})$

$y - 5 = \frac{3}{2}x - 3$

$\quad +5 \qquad +5$

$\boxed{y = \frac{3}{2}x + 2}$

19. $C_1 = (1,2)$ $C_2 = (7,10)$ $r = \sqrt{(x-h)^2 + (y-k)^2}$




$D = \sqrt{(7-1)^2 + (10-2)^2}$

$D = \sqrt{6^2 + 8^2}$

$D = \sqrt{36 + 64}$

$\sqrt{100}$

$\boxed{D = 10}$

19a. $10 - 2 - 4$

$= 8 - 4$

$= 4$

19b. $10 - 2 - 7$

$= 8 - 7$

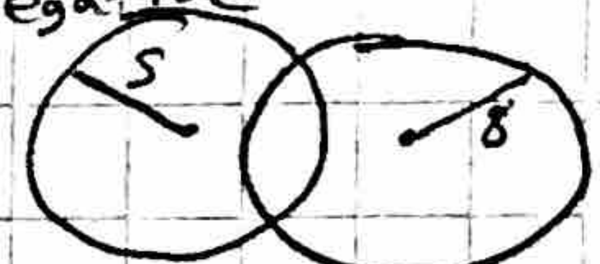
$= 1$

19c. $10 - 5 - 8$

$= 5 - 8$

$= -3$ or $0$

Distance cannot be negative




19d. $15 - 10 - 3$

$= 5 - 3$

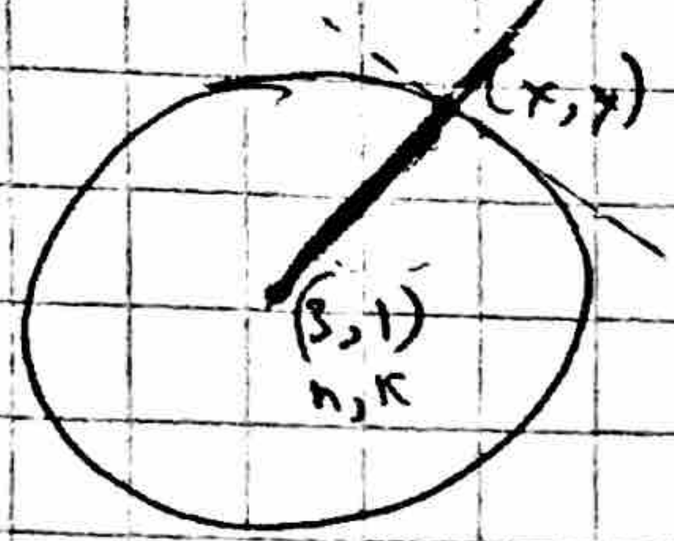
$= 2$

19e. $12 - 10 - 1$

$2 - 1$

$1$

25.




(h, k)
3, 1

h = 3, k = 1

$r = \sqrt{(x-h)^2 + (y-k)^2}$

(h, k) center of circle
(x, y) point on arc

P = (8, 13)

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

$\sqrt{5^2 + 12^2}$

25 + 144

$\sqrt{169}$

r = 13