PreCalc

Rev Ch 10

1. $y = -5x^2 + 40x - 7$

$y = -5(x^2 - 8x + 16) - 7 + 80$

$y = -5(x-4)^2 + 73$

(a) (4, 73)

(b) $x = 4$

(c) down

(d) $(h, k + \frac{1}{4a})$: $(4, 73 + \frac{1}{4(-5)}) = (4, 72.95)$

(e) $y = k - \frac{1}{4a}$ $y = 73 - \frac{1}{4(-5)}$ $y = 73.05$

(f) $|\frac{1}{-5}| = \frac{1}{5}$ unit

2. $7x = y^2 + 12y + 8$

$7x = (y^2 + 12y + 36) + 8 - 36$

$7x = (y+6)^2 - 28$

$x = \frac{1}{7}(y+6)^2 - 4$

(a) (-4, -6)

(b) $y = -6$

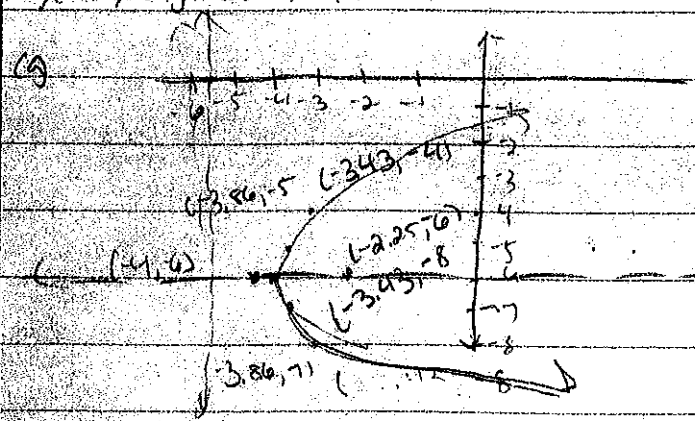
(c) Right

$(h + \frac{1}{4a}, k)$

(d) $(-4 + \frac{1}{4(\frac{1}{7})}, -6) = (-2.25, -6)$

(e) $x = -5.75$

(f) $\frac{1}{7}$ = 7 units



$x = -5.75$

3. h k x y

$(-7, 2)$ $(15, -20)$

$x = a(y+k)^2 + h$

$x = a(y-2)^2 - 7$

$-15 = a(-20-2)^2 - 7$

$-8 = a(-484)$

$a = \frac{1}{22}$

$x = \frac{1}{22}(y-2)^2 - 7$

4. V $(-5, 8)$ F $(-5, 4)$

$y = a(x-h)^2 + k$

$y = a(x+5)^2 + 8$

$y = -\frac{1}{48}(x+5)^2 + 8$

$(h, k + \frac{1}{4a}) = (-5, 4)$

$(-5, 8 + \frac{1}{4a}) = (-5, 4)$

$8 + \frac{1}{4a} = 4$

$\frac{1}{4a} = -12$

$1 = -48a$

$a = -\frac{1}{48}$

(5) $F(-7,12)$ dir $\leftarrow$ $k=-7$ $(-7,12)$ $(h+\frac{1}{4a}, k)$

$x = a(y-k)^2 + h$

$h + \frac{1}{4a} = -7$

$h = -7 - \frac{1}{4a}$

$x = h - \frac{1}{4a}$

$-3 = h - \frac{1}{4a}$

$h = \frac{1}{4a} - 3$

$h = \frac{1}{4(-\frac{1}{8})} - 3 = -5$

$\frac{1}{4a} = \frac{1}{4a} - 3$

$-4 = \frac{2}{4a}$

$-16a = 2$

$a = -\frac{1}{8}$

$x = -\frac{1}{8}(y-12)^2 - 5$

(6) $V(2,6)$ $D: y=4$

$y = a(x-h)^2 + k$

$y = a(x-2)^2 + 6$

$y = \frac{1}{8}(x-2)^2 + 6$

$y = k - \frac{1}{4a}$

$4 = 6 - \frac{1}{4a}$

$-2 = -\frac{1}{4a}$

$8a = 1$

$a = \frac{1}{8}$

(7) $V(12,15)$

Axis $y = 15$

$LR = 5$

$x = a(y-k)^2 + h$

$x = a(y-15)^2 + 12$

$x = -\frac{1}{5}(y-15)^2 + 12$

$|\frac{1}{a}| = 5$

$1 = 5a$

$a = \frac{1}{5}$

x int

$x = -\frac{1}{5}(0-15)^2 + 12$

$= -33$

$(-33, 0)$

y int

$0 = -\frac{1}{5}(y-15)^2 + 12$

$(0, 7.25)$ $(0, 22.75)$

(8) # of sales: 271

max Revenue $6534.13

(9) $y = \frac{-16}{v^2}t^2 + s$

$\frac{550 \text{ mi}}{\text{hr}} \mid \frac{5280 \text{ ft}}{1 \text{ mi}} \mid \frac{1 \text{ hr}}{3600 \text{ sec}}$

≈ 806.67 ft/sec

$0 = \frac{-16}{806.67^2}t^2 + 42{,}000$

$-42000 = \frac{-16}{806.67^2}t^2$

$t \approx 41{,}329.37$ ft

(10) $(x+21)^2 + (y-34)^2 = 196$

(11) $(x^2+18x+81) + (y^2-22y+121) = 87 + 81 + 121$

$(x+9)^2 + (y-11)^2 = 289$

$C: (-9, 11)$ $r = 17$

(12) $V(0, \pm 9)$ $F(0, \pm 6)$

$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$

$a = 9$

$c = 6$

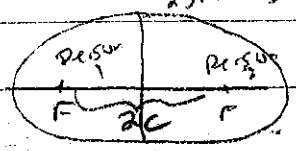
$c^2 = a^2 - b^2$

$36 = 81 - b^2$

$-45 = -b^2$

$\frac{x^2}{45} + \frac{y^2}{81} = 1$

(13)



$45.25 = 2a$

$a = 22.625$

(a) $\frac{x^2}{(22.625)^2} + \frac{y^2}{11.75^2} = 1$

(b) $c \approx 19.33$ $2c \approx 38.67$ ft

(14) $81x^2 + 25y^2 = 2025$

$\frac{x^2}{25} + \frac{y^2}{81} = 1$

$a = 9$

$b = 5$

(a) [illegible]

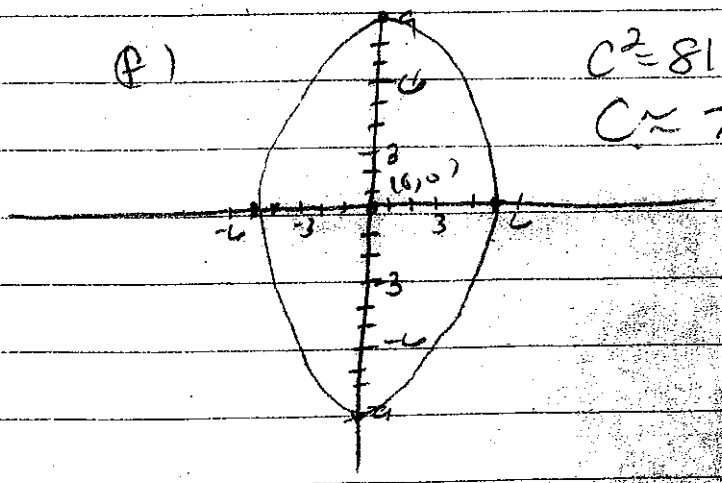
(b) [illegible] $(0, 9)$

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f)



$c^2 = 81 - 25$

$c \approx 7.48$

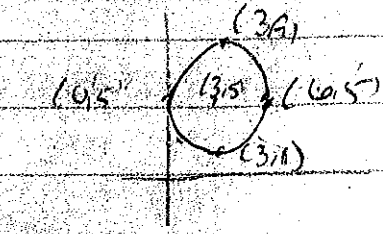
15 (a) $\frac{(x-3)^2}{9} + \frac{(y-5)^2}{16} = 1$

(b) C(3,5)

F(3,7.65), (3,2.35)

maj 8 units

min 6 units



(c) the coefficients determine whether the maj axis is horiz or vert. Also determines how elongated the ellipse is

(c) $e = \frac{c}{a} = \frac{2.65}{4} = .6625$

16 (2,5) (8,5) (3,5)

$2a = 16$ $c = 5$

$a = 8$ $5^2 = 8^2 - b^2$

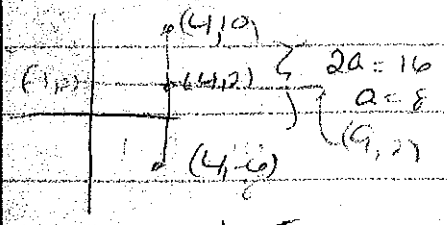
$b^2 = 39$

$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

$\frac{(x-3)^2}{64} + \frac{(y-5)^2}{39} = 1$

17 (4,10), (4,-6) (-1,2), (9,2)

maj ⊥ min



$2a = 16$

$a = 8$

(9,2)

$a = 8$ $b = 5$

$\frac{(x-4)^2}{25} + \frac{(y-2)^2}{64} = 1$

18 maj = 34

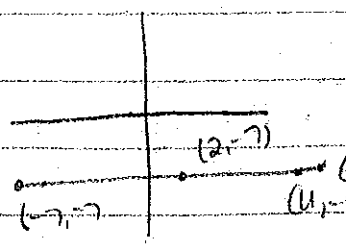
$a = 17$

minor 26

$b = 13$

$\frac{(x-9)^2}{169} + \frac{(y-12)^2}{289} = 1$

19

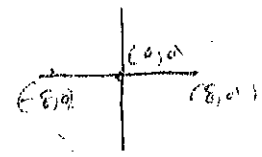


$a = 10$ $c = 9$ $9^2 = 10^2 - b^2$

$19 = b^2$

$\frac{(x-2)^2}{100} + \frac{(y+7)^2}{19} = 1$

(20) V(±8,0)
15 c



$\frac{x^2}{64} + \frac{y^2}{b^2} = 1$

$\frac{5^2}{64} + \frac{36}{b^2} = 1$

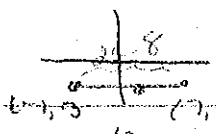
$\frac{36}{b^2} = \frac{39}{64}$

$36 = \frac{39}{64} b^2$

$b^2 = \frac{2304}{39}$

$\frac{x^2}{64} + \frac{y^2}{\frac{768}{13}}$

(21) V(-1,-3)(7,-3) minor 3



$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

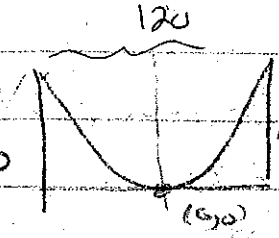
(3,-3) Center

$\frac{(x-3)^2}{16} + \frac{(y+3)^2}{\frac{9}{4}}$

$2b = 3$

$b = 1.5$

(22)

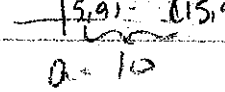


$y = ax^2$

$-20 = a(60)^2$

$y = \frac{1}{180} x^2$

(23) C(5,9)
V(15,9)
minor 6

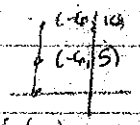


$a = 10$

$\frac{(x-5)^2}{100} + \frac{(y-9)^2}{9} = 1$

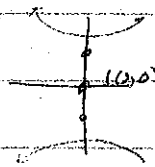
$\frac{b}{3} = 3$

(24) V(-6,10) (-6,0)
minor 2



$\frac{(x+6)^2}{1} + \frac{(y-5)^2}{25} = 1$

(25) F(0,9)
(0,-9)
TA = 5



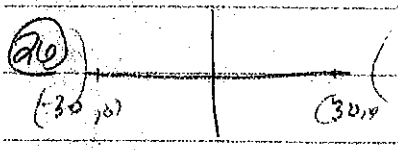
$c = 9 \quad a = 2.5$

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

$81 = 2.5^2 + b^2$

$\frac{y^2}{6.25} - \frac{x^2}{74.75} = 1$

(26)



$\frac{x^2}{225} - \frac{y^2}{675} = 1$

$2a = 30 \quad c = 30$

$a = 15 \quad 30^2 = 15^2 + b^2$

$b^2 = 675$

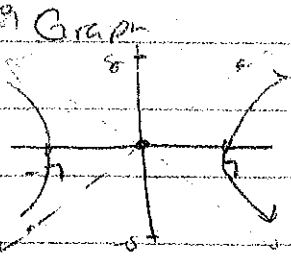
(27) (a) (0,0)

(b) (±7,0)

(c) (±10.67,0)

(d) $y = \pm \frac{b}{a} x = \pm \frac{8}{7} x$

Graph



$a = 7$

$b = 8$

$c^2 = 49 + 64$

$c^2 = 113$

$c \approx 10.63$

(28) $9y^2 + 54y - 25x^2 - 100x = 244$

$9(y^2 + 6y + 9) + 25(x^2 + 4x + 4) = 244 + 81 - 100$

$9(y+3)^2 - 25(x+2)^2 = 225$

(a) $\frac{(y+3)^2}{25} - \frac{(x+2)^2}{9} = 1$

$c^2 = 25 + 9$

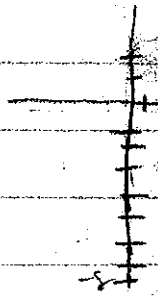
$c = 5.83$

(b) (-2,-3)

(c) (-2,2)
(-2,-8)

(d) (-2,2.83)
(-2,-8.83)

$a = 5$



(e) $y = k \pm \frac{a}{b}(x-h)$

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

(29) $4x^2 + 48x - 81y^2 + 162y = 261$

$4(x^2+12x+36) - 81(y^2-2y+1) = 261 + 144 - 81$

$4(x+6)^2 - 81(y-1)^2 = 324$

(a) $\frac{(x+6)^2}{81} - \frac{(y-1)^2}{4} = 1$

(b) $(-6,1)$

(c) $(-15,1), (3,1)$

(d) $(\quad,1)(\quad,1)$

(e) $y = k \pm \frac{b}{a}(x-h)$

$y = 1 \pm \frac{4}{9}(x+6)$

$c^2 = 85$

$c \approx 9.22$

(30) $V(-2,4)\ (-2,-2)$

$F(-2,7)\ (-2,-5)$

$\frac{(y-1)^2}{9} + \frac{(x+2)^2}{27} = 1$

$2a = 6$, $a = 3$; $2c = 12$, $c = 6$

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

$36 = 9 + b^2$

$b^2 = 27$

(31) $V(-2,-2)\ (6,-5)$

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

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

$m = \frac{b}{a}$

$\frac{2}{3} = \frac{b}{4}$

$\frac{8}{3}$

$y = k \pm \frac{b}{a}(x-h)$

$y = 5 \pm \frac{b}{c}(x-2)$

$= 5 \pm \frac{\frac{8}{3}}{4}(x-2)$

(32) Circle (33) Ellipse (34) parabola (35) hyperbola

(36) (a) $t = 6$

$x = 3t^2 + 8t - 4 = 3(6)^2 + 8(6) - 4 = 152$ $\quad (152, -21/5)$

$y = \frac{4}{5}x - 9 = -\frac{21}{5}$

(b) $x = 12\cos\theta = -6$ $\quad (-6, -2\sqrt{3})$

$y = -6\sin\theta = -3\sqrt{3}$

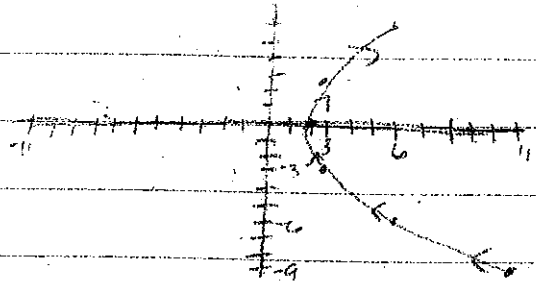
$t = \frac{2\pi}{3}$ $\quad -6 + \sqrt{3} = -3\sqrt{3}$

$-6\left(\frac{\sqrt{3}}{2}\right)$

(37) $x = t^2 + 2$

$y = 3t$

t	-3	-2	-1	0	1	2
x	11	6	3	2	3	6
y	-9	-6	-3	0	3	6



No

$2x + 16$

$2x \quad 4x^2 + 32x$

$+16 \quad 32x + 256$

(38) $x = \frac{1}{2}t - 8$ $\quad y = t^2 + 5$

$x + 8 = \frac{1}{2}t$ $\quad y = (2x + 16)^2 + 5$

$2x + 16 = t$ $\quad = 4x^2 + 64x + 256 + 5$

$y = 4x^2 + 64x + 261$ a parabola

$x = \frac{1}{2}t - 8$

$x + 8 = \frac{1}{2}t$

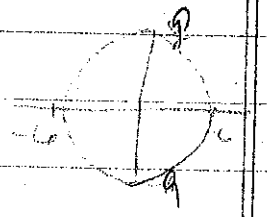
$t = 2x + 16$

(39) $x = 6\cos\theta$ $\quad y = 9\sin\theta$

$\cos\theta = \frac{x}{6}$ $\quad \sin\theta = \frac{y}{9}$

$\cos^2\theta + \sin^2\theta = 1$

$\frac{x^2}{36} + \frac{y^2}{81} = 1$



(40) $y = x^2 - 4$ $\quad t = x + 8$

$y = (t - 8)^2 - 4$ $\quad x = t - 8$

$x = t + 8$

$y = (t - 8)^2 - 4$

$y = x^2 - 4$

t	5	6	7	8	9	10
x	-3	-2	-1	0	1	2
y	5	0	-3	-4	-3	0