1) $x - y^2 + 4y - 2 = 0$

$= y^2 - 4y = x - 2$

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

$(y-2)^2 = x + 2$ shift $(-2, +2)$

$\boxed{(y-2)^2 = 1(x+2)}$

vertex $= (-2, 2)$

$y^2 = 1x$

$4p = 1,\ p = \frac{1}{4}$

Original — Shift $(-2, 2)$

V $(0,0) \longrightarrow$ V $(-2, 2)$

F $(\frac{1}{4}, 0) \longrightarrow$ F $(-\frac{7}{4}, 2)$

Directrix $x = -\frac{1}{4} \longrightarrow x = -2\frac{1}{4}$

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2) $\frac{(x-3)^2}{4} + \frac{y^2}{16} = 1$ Shift $= (3, 0)$

original $\frac{x^2}{4} + \frac{y^2}{16} = 1$ $a = 4$, $b = 2$

Center $(0,0) \xrightarrow{\text{Shift } (3,0)} (3,0)$

vertices $(0, \pm 4) \longrightarrow (3, \pm 4)$

Foci $a = 4,\ b = 2$

$c^2 = 16 - 4 = 12$

$c = \sqrt{12}$

$(0, \pm\sqrt{12}) = (0, \pm 2\sqrt{3}) \longrightarrow (3, \pm 2\sqrt{3})$

eccentricity $= \frac{c}{a} = \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2} \longrightarrow \frac{\sqrt{3}}{2}$

3) $\frac{(x+4)^2}{16} - \frac{y^2}{16} = 1$ Shift = $(-4, 0)$

original $\frac{x^2}{16} - \frac{y^2}{16} = 1$

$a = 4, \quad b = 4$ shift $(-4,0)$

center = $(0,0)$ → $(-4, 0)$

Vertices = $(\pm 4, 0)$ $(4,0)$ → $(0,0)$; $(-4,0)$ → $(-8,0)$

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

$c^2 = 16 + 16 \quad c = \sqrt{32}$ $(4\sqrt{2}, 0)$ → $(4\sqrt{2}-4, 0)$

$c = \pm 4\sqrt{2} \quad (\pm 4\sqrt{2}, 0)$ $(-4\sqrt{2}, 0)$ → $(-4\sqrt{2}-4, 0)$

asymptotes $= \pm \frac{4}{4}x = \pm 1x$

$(y-k) = \pm m(x-h)$ → $y = 1(x+4)$ → $y = x + 4$

$(y-0) = \pm 1(x+4)$ → $y = (-x-4)$ → $y = -x - 4$

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4) $9x^2 - 72x - 16y^2 - 32y - 16 = 0$

$9(x^2 - 8x) - 16(y^2 + 2y) = 16$

$\underline{9}(x - \underline{4})^2 - \underline{\underline{16}}(y + \underline{\underline{1}})^2 = 16 + \underline{9}(\underline{16}) + (-16)(1)$

$\frac{9(x-4)^2}{144} - \frac{16(y+1)^2}{144} = \frac{144}{144}$

$\frac{(x-4)^2}{16} - \frac{(y+1)^2}{9} = 1$ Shift = $(4, -1)$

original $\frac{x^2}{16} - \frac{y^2}{9} = 1$ $a = 4$, $b = 3$

vertices $= (\pm 4, 0)$

asymptotes $= \pm \frac{3}{4}x$

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

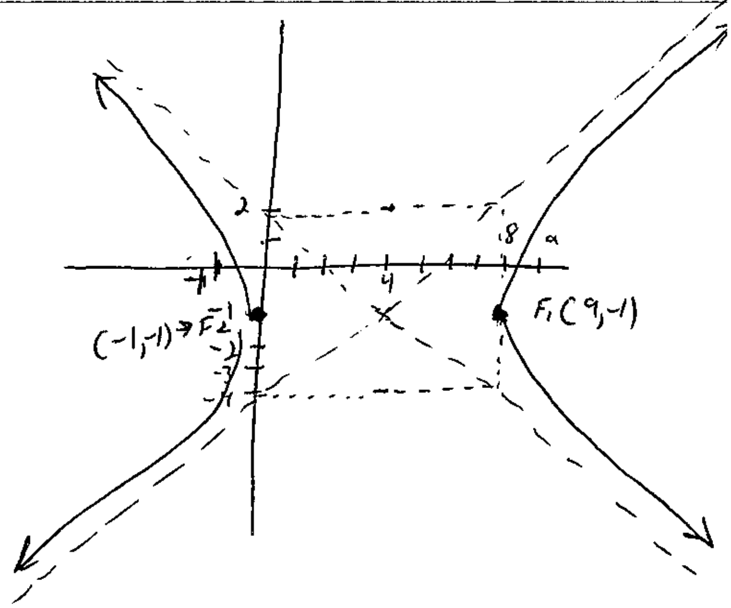
$c^2 = 9 + 16$

$c = \pm 5$

Foci: $(\pm 5, 0)$

#4)

	original	shift (4,−1)
center	(0,0) →	(4,−1)
vertices	(4,0) →	(8,−1)
	(−4,0) →	(0,−1)
Foci	(5,0) →	(9,−1)
	(−5,0) →	(−1,−1)
b	(0,3) →	(4,2)
	(0,−3) →	(4,−4)



5a) $x^2 + 6x + 12y + 9 = 0$ = parabola

5b) $2x^2 + y^2 = 2y + 1$ = ellipse

5c) $x^2 + 16 = \underbrace{4(y^2 + 2x)}_{\equiv x^2 + y^2}$ = hyperbola

6a) Hyperbola center = (0,0) vertex = (0,4) ← a = 4
focus = (0,5) ← c = 5

Equation

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

$$\boxed{\frac{y^2}{16} - \frac{x^2}{9} = 1}$$

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

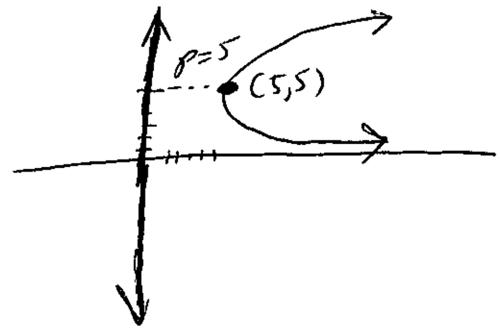
$25 = 16 + b^2$ = $b^2 = 9$

$b = 3$

Page 2a

6b) Parabola vertex (5,5)
directrix = y-axis (x=0)

$\downarrow$
y^2



Basic Equation format

$y^2 = 4px$

$y^2 = 4px$

$y^2 = 4(5)x$

$y^2 = 20x$

Equation before shift

Shift = (5,5)

$$\boxed{(y-5)^2 = 20(x-5)}$$

6c) Ellipse foci (0,0) (0,8) major axis = 10
= c = ± 4 = vertical = 2a → a = 5

Basic Equation

$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1 \quad = \frac{x^2}{9} + \frac{y^2}{25} = 1 \Rightarrow$ Shift = (0,4) $\boxed{\frac{x^2}{9} + \frac{(y-4)^2}{25} = 1}$

$a = 5,\ C = 4,$

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

$16 = 25 - b^2$

$b^2 = 9$

$b = 3$

Basic Graphs

(0,5)

(0,-5)

$\boxed{\begin{array}{l} (0,4) \xrightarrow{?} (0,8) \\ (0,-4) \xrightarrow{?} (0,0) \end{array}}$ → ? = shift = (0,4)

(3,0) →

(-3,0) →

? = (0,4) = shift

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6 d) Hyperbola vertices (0, 2) (0, -2) asymptotes $y = \pm \frac{1}{2}x$

Basic Equation $\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$ $V(0, \pm 2)$

$a = \pm 2$

asymptotes $y = \pm \frac{a}{b}$ $a = 2$ $b = ?$

$a = 2$

$b = 4$

$\Rightarrow \frac{1}{2} = \frac{2}{b} = b = 4$

Equation $\boxed{\frac{y^2}{4} - \frac{x^2}{16} = 1}$