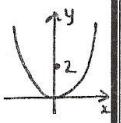
PARABOLA SOLUTIONS

① $x^2 = 8y$

$4a = 8$

$a = 2$ $\therefore$ focus is $(0,2)$

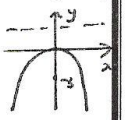


② $x^2 = -12y$

$4a = 12$

$a = 3$

$\therefore$ Directrix is $y = 3$



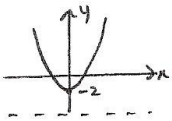
③ $x^2 = 8(y+2)$ $\therefore 4a = 8$

$a = 2$

(a) Vertex is $(0,-2)$

(b) Focus is $(0,0)$

(c) directrix is $y = -4$



④ $y = x^2 - 6x + 5$

$\therefore x^2 - 6x = y - 5$

$x^2 - 6x + 9 = y - 5 + 9$

$(x-3)^2 = y + 4$

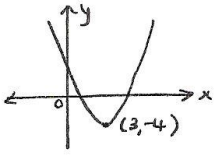
$(x-3)^2 = 1(y+4)$

$\therefore 4(a) = 1$

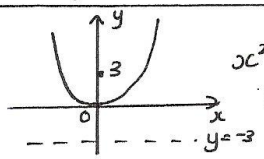
$a = 1/4$

(a) vertex is $(3,-4)$

(b) focus is $(3, -3\frac{3}{4})$



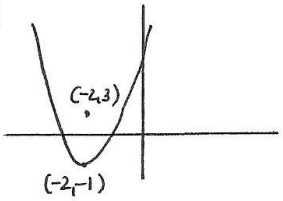
⑤



$x^2 = 4.3.y$

$x^2 = 12y$

⑥ (a)

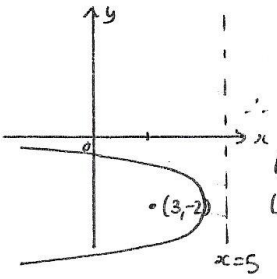


$a = 3 + 1 = 4$

$\therefore$ parabola is $(x+2)^2 = 4.4.(y+1)$

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

(b)



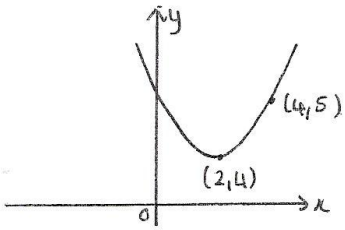
$a = 1$

$\therefore$ parabola is

$(y+2)^2 = -4.1(x-3)$

$(y+2)^2 = -4(x-3)$

(c)



parabola is $(x-2)^2 = 4a(y-4)$

passes through $(4,5)$

$\therefore (4-2)^2 = 4a(5-4)$

$4 = 4a$

$\therefore a = 1$

parabola is $(x-2)^2 = 4(y-4)$

⑦ (a) $x^2 = 4y$ $\therefore y = \frac{x^2}{4}$

$\frac{dy}{dx} = \frac{2x}{4} = \frac{x}{2}$

when $x = 2$, $\frac{dy}{dx} = \frac{2}{2} = 1$

$\therefore$ tangent is $y - 1 = 1(x-2)$

$y - 1 = x - 2$

$x - y = 1$

when $x = -2$, $\frac{dy}{dx} = \frac{-2}{2} = -1$

$\therefore$ tangent is $y - 1 = -1(x+2)$

$y - 1 = -x - 2$

$x + y = -1$

(b) $x - y = 1$ - - - ①

$x + y = -1$ - - - ②

① + ② $2x = 0$

$x = 0$

subs in ② $0 + y = -1$

$\therefore y = -1$

$\therefore$ point of intersection is $(0,-1)$

which is on the directrix $y = -1$

⑧ $x^2 = 5y$ $\therefore y = \frac{x^2}{5}$

$\frac{dy}{dx} = \frac{2x}{5}$

when $x = -5$, $\frac{dy}{dx} = \frac{2(-5)}{5} = -2$

$\therefore$ normal is $y - 5 = \frac{1}{2}(x+5)$

$2y - 10 = x + 5$

$x - 2y + 15 = 0$