

## Completing the Square

For the following questions, complete the square, identify the line of symmetry and the coordinates of the turning point. sketch the graphs showing line of symmetry, turning point and intercept on the y-axis.

$$1) \quad y = x^2 - 8x + 10$$

$$2) \quad y = x^2 + 5x + 8$$

$$3) \quad y = 5x^2 + 10x + 8$$

$$4) \quad y = 4x^2 - 12x + 9$$

$$5) \quad y = -2x^2 + 5x + 1$$

$$6) \quad y = -3x^2 - 9x + 5$$

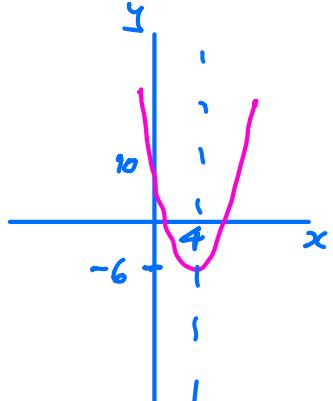
$$1) \quad y = x^2 - 8x + 10$$

$$y = (x-4)^2 + 10 - 16$$

$$y = (x-4)^2 - 6$$

line of symmetry  $x = 4$

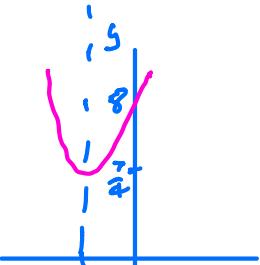
minimum point  $(4, -6)$



$$2) \quad y = x^2 + 5x + 8$$

$$y = (x + \frac{5}{2})^2 + 8 - \frac{25}{4}$$

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



line of symmetry  $x = -\frac{5}{2}$   
minimum point  $(-\frac{5}{2}, \frac{7}{4})$



3)

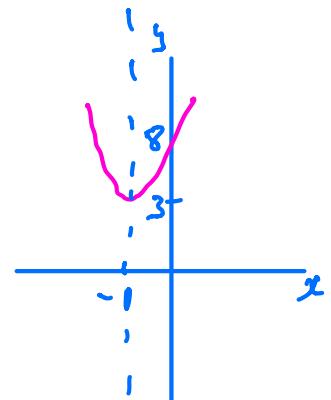
$$y = 5x^2 + 10x + 8$$

$$y = 5\left[x^2 + 2x + \frac{8}{5}\right]$$

$$y = 5\left[(x+1)^2 + \frac{8}{5} - 1\right]$$

$$y = 5(x+1)^2 + 8 - 5$$

$$y = 5(x+1)^2 + 3$$



line of symmetry  $x = -1$

minimum point  $(-1, 3)$

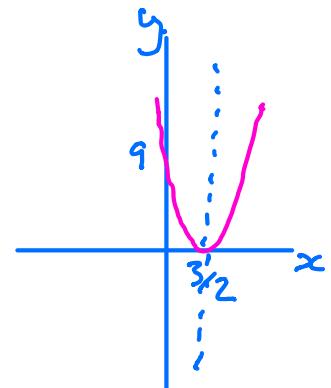
4)

$$y = 4x^2 - 12x + 9$$

$$y = 4\left[x^2 - 3x + \frac{9}{4}\right]$$

$$y = 4\left[\left(x - \frac{3}{2}\right)^2 + \frac{9}{4} - \frac{9}{4}\right]$$

$$y = 4\left(x - \frac{3}{2}\right)^2$$



line of symmetry  $x = \frac{3}{2}$

minimum point  $(\frac{3}{2}, 0)$

$$5) \quad y = -2x^2 + 5x + 1$$

$$y = -2 \left[ x^2 - \frac{5}{2}x - \frac{1}{2} \right]$$

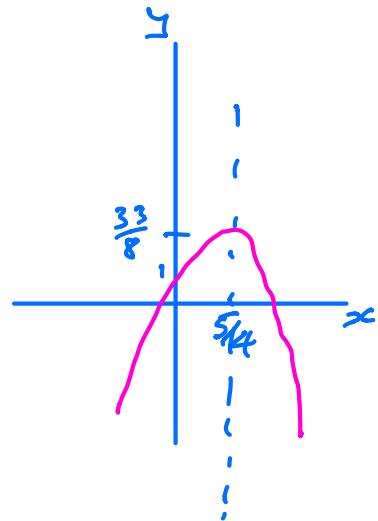
$$y = -2 \left[ (x - \frac{5}{4})^2 - \frac{1}{2} - \frac{25}{16} \right]$$

$$y = -2(x - \frac{5}{4})^2 + 1 + \frac{25}{8}$$

$$y = -2(x - \frac{5}{4})^2 + \frac{33}{8}$$

line of symmetry  $x = \frac{5}{4}$

maximum point  $(\frac{5}{4}, \frac{33}{8})$



$$6) \quad y = -3x^2 - 9x + 5$$

$$y = -3 \left[ x^2 + 3x - \frac{5}{3} \right]$$

$$y = -3 \left[ (x + \frac{3}{2})^2 - \frac{5}{3} - \frac{9}{4} \right]$$

$$y = -3(x + \frac{3}{2})^2 + 5 + \frac{27}{4}$$

$$y = -3(x + \frac{3}{2})^2 + \frac{47}{4}$$

line of symmetry  $x = -\frac{3}{2}$

maximum point  $(-\frac{3}{2}, \frac{47}{4})$

