

Sample Questions Set 08

Recap: Completing the square:

Rewrite $px^2 + qx + r$ p, q, r constants

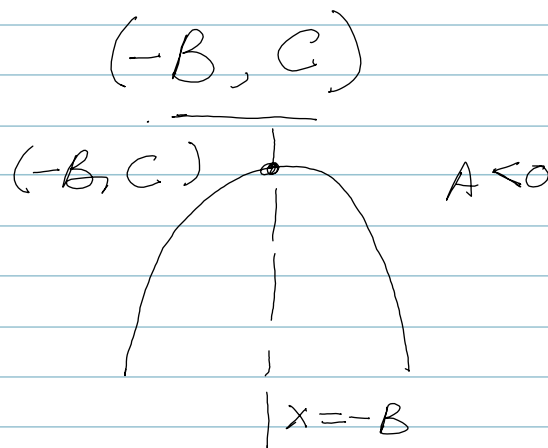
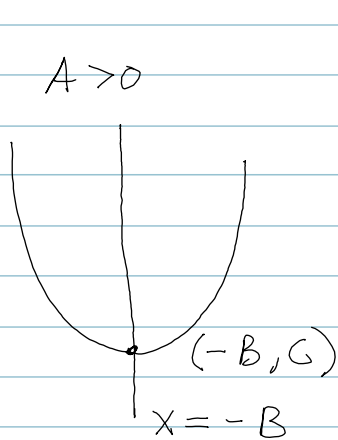
$$\rightsquigarrow A(x+B)^2 + C$$

$\begin{matrix} & \uparrow & & \uparrow \\ & >0 & & <0 \\ \Psi & \text{or} & \Psi & \\ \downarrow & & \downarrow & \\ x = -B & & x = -B & \end{matrix}$

Axis of symmetry:

$$x+B=0 \Rightarrow x=-B$$

Vertex (max or min point)



1. $f(x) = 3x^2 - 2 = 3(x+0)^2 - 2$

\rightsquigarrow > 0 min turning curve \cup

Min of $f(x)$ is -2
occurring at $x = 0$

> 0 so min-turning quadratic \cup

$$\begin{aligned} 2. \quad g(x) &= x^2 + 4x - 7 = \underbrace{x^2 + 4x + 2^2 - 2^2}_{\text{minimum}} - 7 \\ &= (x+2)^2 - 4 - 7 = \underbrace{(x+2)^2}_{\text{!}} - 11. \end{aligned}$$

$$\begin{cases} x+2=0 \\ x=-2 \end{cases}$$

Min. of $g(x)$ is -11 occurring at $x = -2$

< 0

$$\begin{aligned} 3. \quad g(x) &= -3x^2 + 4x + 2 = -3 \left(x^2 - \frac{4}{3}x \right) + 2 \\ &= -3 \left(\underbrace{x^2 - \frac{4}{3}x + \left(-\frac{2}{3}\right)^2 - \left(-\frac{2}{3}\right)^2}_{\text{minimum}} \right) + 2 \end{aligned}$$

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

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

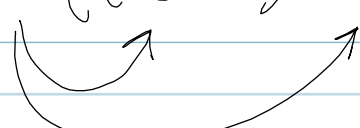
$$\begin{aligned} x - \frac{2}{3} &= 0 \\ x &= \frac{2}{3} \end{aligned}$$


$$= -3 \left(x - \frac{2}{3} \right)^2 + \frac{10}{3}$$

< 0 max-turning -

Max. of $g(x)$ is $10/3$ occurring at $x = 2/3$

$$4. \quad r(x) = -12x - 2x^2 = -2x^2 - 12x$$
$$= -2(x^2 + 6x) = -2(x^2 + 6x + 3^2 - 3^2)$$

$$= -2((x+3)^2 - 9)$$


$$= -2(x+3)^2 + 18$$


< 0 max. turning -

Max. of $r(x)$ is 18 occurring at $x = -3$