

8(a)

$$x = 0$$

$$2|0^2 - 16| + 4(0 - 4) = 16$$

M1

Two cases to consider,

$$x^2 - 16 \geq 0 \text{ and } x^2 - 16 \leq 0$$

May be stated or implied by working

M1

$$\text{For } x^2 - 16 \geq 0$$

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

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

M1

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

$$y = (x - 4)(2x + 12)$$

$$x = 4 \text{ or } x = -6$$

M1

$$\text{For } x^2 - 16 \leq 0$$

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

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

M1

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

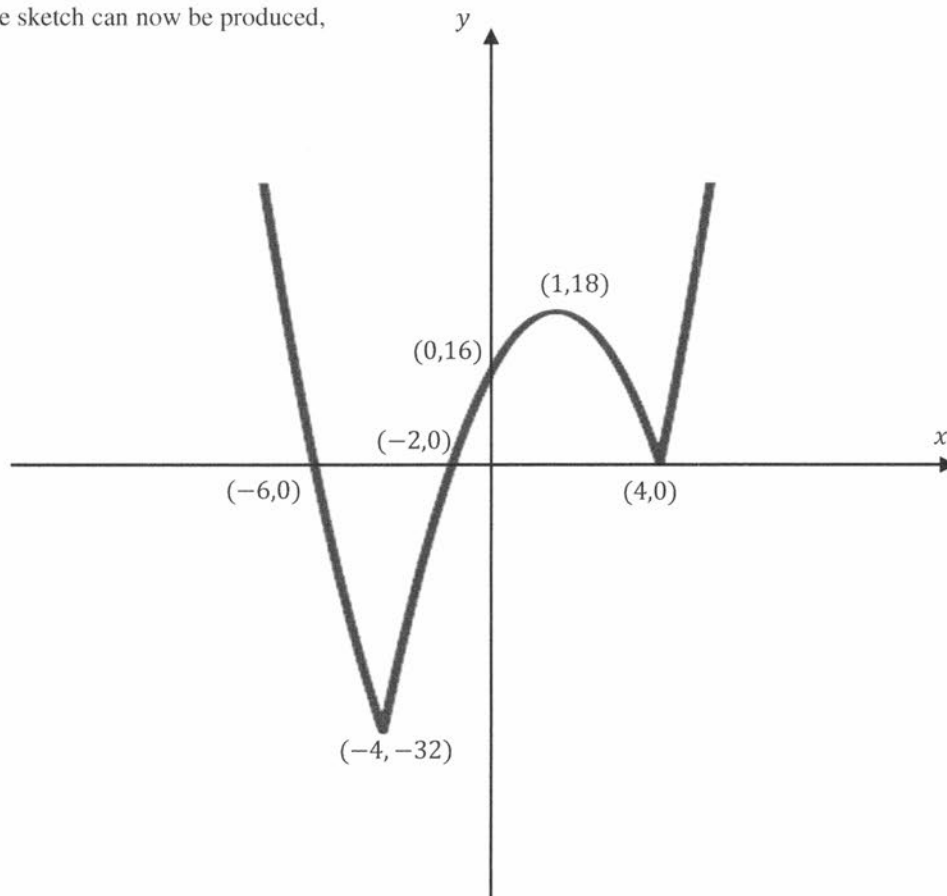
$$y = (x - 4)(-2x - 4)$$

$$x = 4 \text{ or } x = -2$$

M1

8(a) cont.

The sketch can now be produced,



B1 For general shape

B1 For x -intercepts correct

B1 For turning points correct

[9]

8(b)

$$\int_{-6}^{-2} 2|x^2 - 16| + 4(x - 4) dx = \int_{-6}^{-4} (x - 4)(2x + 12) dx + \int_{-4}^{-2} (x - 4)(-2x - 4) dx$$

$$= \int_{-6}^{-4} 2x^2 + 4x - 48 dx + \int_{-4}^{-2} -2x^2 + 4x + 16 dx$$

$$= \left[\frac{2}{3}x^3 + 2x^2 - 48x \right]_{-6}^{-4} + \left[-\frac{2}{3}x^3 + 2x^2 + 16x \right]_{-4}^{-2}$$

$$= \left(\left(\frac{2}{3}(-4)^3 + 2(-4)^2 - 48(-4) \right) - \left(\frac{2}{3}(-6)^3 + 2(-6)^2 - 48(-6) \right) \right)$$

$$+ \left(\left(-\frac{2}{3}(-2)^3 + 2(-2)^2 + 16(-2) \right) - \left(-\frac{2}{3}(-4)^3 + 2(-4)^2 + 16(-4) \right) \right)$$

$$= \frac{544}{3} - 216 - \frac{56}{3} - \frac{32}{3} = -64$$

Hence the area is 64 square units

M1

M1

M1

M1

B1

[5]

[14 marks]