

Name: _____



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Find the co-ordinate(s) of the turning point(s):

a) $y = x^2 + 8x - 2$

 $(-4, -18)$

e) $y = 3x^2 + 12x - 12$

 $(-2, -24)$

b) $y = x^2 - 12x + 6$

 $(6, -30)$

f) $y = 4x^2 - 16x - 2$

 $(2, -18)$

c) $y = 2x^2 - 16x$

 $(4, -32)$

g) $y = 32x - 2 - 4x^2$

 $(4, 62)$

d) $y = x^3 + x^2 - 8x - 1$

 $(-2, 11)$ and $\left(\frac{4}{3}, -\frac{203}{27}\right)$

h) $y = x^3 - 2x^2 - 7x - 5$

 $(-1, -1)$ and $\left(\frac{7}{3}, -\frac{527}{27}\right)$

Find the co-ordinate of the turning point and determine its nature:

a) $y = x^2 + 4x + 3$

 $(-2, -1)$ Minimum

d) $y = 5x^2 - 20x - 3$

 $(2, -23)$ Minimum

b) $y = x^2 - 6x + 2$

 $(3, -7)$ Minimum

e) $y = 4 - 16x - 4x^2$

 $(-2, 20)$ Maximum

c) $y = -x^2 - 6x + 1$

 $(-3, 10)$ Maximum

f) $y = 12x + 5 - 2x^2$

 $(3, 23)$ Maximum**Exam question:**

Find the co-ordinates of the turning points and determine their nature:

$y = x^3 - 12x^2 - 1$

 $(0, -1)$ Maximum **$(8, -257)$ Minimum**

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For each question:

i) Find an expression for the velocity

ii) Find an expression for the acceleration

a) $s = 2t^3 + 6t + 4$

i) $v = 6t^2 + 6$

ii) $a = 12t$

iii) Find the acceleration when $t = 3$

$$a = 36$$

b) $s = t^3 + 5t^2 - 4$

i) $v = 3t^2 + 10t$

ii) $a = 6t + 10$

iii) Find the velocity when $t = 4$

$$v = 88$$

c) $s = 6 + 3t^2 + 2t^3$

i) $v = 6t + 6t^2$

ii) $a = 6 + 12t$

iii) Find the acceleration when $t = 4$

$$a = 54$$

d) $s = 5t^3 + 4t^2 - 2t$

i) $v = 15t^2 + 8t - 2$

ii) $a = 30t + 8$

iii) Find the initial acceleration when $t = 0$

$$a = 8$$

e) $s = 8t^2 - 6t - 1$

i) $v = 16t - 6$

ii) $a = 16$

iii) Find time when the velocity is 106ms^{-1}

$$t = 7$$

f) $s = 4t^3 - 5t^2 + 6t$

i) $v = 12t^2 - 10t + 6$

ii) $a = 24t - 10$

iii) Find the time when $a = 14\text{ms}^{-2}$

$$t = 1$$

Exam question:

A particle P is moving along a straight line.
At time t seconds, the displacement of P is s metres where $s = t^3 - 6t^2 - 63t - 4$
Find the minimum velocity of P.

$$\text{min } v = -75 \text{ when } t = 2$$

