Solutions

Each answer shows the steps, then the **result**.

2.1

- $\dfrac{dy}{dx} = 12x^3 + \dfrac{2}{x^2}$

2.2

- $\dfrac{dy}{dx} = 5(3x+1)^4 \cdot 3 = 15(3x+1)^4$

3.1 C

- $\dfrac{dy}{dx} = 3x^2 - 2$; at $x = 2$, $= 12 - 2 = 10$

3.2

(a)

- $\dfrac{dy}{dx} = 3x^2 - 6x - 9 = 3(x-3)(x+1) = 0$; $x = 3$ or $x = -1$; $y(3) = 27 - 27 - 27 + 5 = -22$ and $y(-1) = -1 - 3 + 9 + 5 = 10$, so $(3, -22)$ and $(-1, 10)$

(b)

- $\dfrac{d^2y}{dx^2} = 6x - 6$; at $x = 3$ it is $12 > 0$
- minimum, at $x = -1$ it is $-12 < 0$
- maximum; the curve falls between the maximum and the minimum, so it is decreasing for $-1 < x < 3$

3.3

- $\dfrac{dy}{dx} = -\dfrac{8}{x^2}$; at $x = 2$, gradient $= -2$; normal gradient $= \frac{1}{2}$; $y - 4 = \frac{1}{2}(x-2) \Rightarrow y = \frac{1}{2}x + 3$