1. Given: $f(x) = \frac{2}{3}x^3 - \frac{7}{2}x^2 - 4x + 1$

> (a) Find $f'(x)$ (3 marks)
>
> (b) Find the intervals of x for which $f(x)$ is increasing and decreasing   (4 marks)
>
> (c) Find $f''(x)$ (2 marks)
>
> (d) Find the intervals of x for which $f(x)$ is concave up and concave down   (4 marks)

Mark scheme:

> (a) $f'(x) = 2x^2 - 7x - 4$ (A1)(A1)(A1)
>
> (b) $0 = 2x^2 - 7x - 4$ (M1) ft Setting their first derivative = 0
> Solving for x (A1) ft
> $0 = (2x + 1)(x - 4)$
> $x = -\frac{1}{2}, 4$
>
> Increasing: $\left(-\infty, -\frac{1}{2}\right) \cup (4, \infty)$ (A1) ft
>
> Decreasing: $\left(-\frac{1}{2}, 4\right)$ (A1) ft
>
> (c) $f''(x) = 4x - 7$ (A1) ft (M1) ft
>
> (d) $0 - 4x - 7$ (M1) ft Setting their second derivative = 0
> $x = \frac{7}{4}$ (A1) ft
> Concave up: $\left(-\infty, \frac{7}{4}\right)$ (A1) ft
>
> Concave down: $\left(\frac{7}{4}, \infty\right)$ (A1) ft