

Owain Wilcox (2003601) Maths Semester 2 3pm Exam. Apparently, I need 20 words in this document to submit to Turnitin so here are 20 words.

Owain Wilcox (2003601)

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$$\begin{aligned} \textcircled{1} P(x) &= \sqrt{\frac{1}{2x^3} + (2x)^3 - \frac{6}{7}} \\ P(x) &= \left(\frac{1}{2x^3} + (2x)^3 - \frac{6}{7} \right)^{\frac{1}{2}} \\ P(x) &= \frac{1}{2} \left(\frac{1}{2x^3} + 8x^3 - \frac{6}{7} \right) \times \left(-\frac{3}{2} x^{-4} + 24x^2 \right) \\ P(x) &= \left(-\frac{3}{4} x^{-4} + 12x^2 \right) \times \left(\frac{1}{2x^3} + 8x^3 - \frac{6}{7} \right) \end{aligned}$$

$$\begin{aligned} \textcircled{b} g(x) &= \frac{5x+3}{2x+1} \\ g'(x) &= \frac{5(2x+1) - 2(5x+3)}{(2x+1)^2} \end{aligned}$$

$$g'(x) = \frac{10x+5 - 10x-6}{(2x+1)^2}$$

$$g'(x) = -1(2x+1)^{-2}$$

$$\textcircled{2} y = \frac{(3x+1) \sin^3(x)}{e^{2x}}$$

$$\ln y = \ln(3x+1) + \ln \sin^3(x) - \ln(e^{2x})$$

$$\ln y = \ln(3x+1) + 3 \ln \sin(x) - 2x \ln(e)$$

$$\begin{aligned} \frac{y'}{y} &= \frac{3}{(3x+1)} + 3 \left(\frac{\cos(x)}{\sin(x)} \right) - 2 \times 1 \\ y' &= \left(\frac{3}{3x+1} + 3 \cot(x) - 2 \right) \times \left(\frac{(3x+1) \sin^3(x)}{e^{2x}} \right) \end{aligned}$$

$$\textcircled{3} f(x, y) = x^2 \sin(2x+3y)$$

$$\begin{aligned} f'(x) &= 2x \sin(2x+3y) + x^2 2 \cos(2x+3y) \\ &= 2x \sin(2x+3y) + 2x^2 \cos(2x+3y) \end{aligned}$$

$$\textcircled{b} f''(y) = 3(2x \sin(2x+3y)) + 3(2x^2 \cos(2x+3y))$$

$$f''(y) = 6x \sin(2x+3y) + 6x^2 \cos(2x+3y)$$

$$f''(y) = 6x \cos(2x+3y) - 6x^2 \sin(2x+3y)$$

④ $f(x) = -2x^3 + x^2 + 8x - 10$ along x of $(-4, 4)$

$$f'(x) = -6x^2 + 2x + 8 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2(a)}$$

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(-6)(8)}}{2(-6)}$$

$$x = \frac{-2 \pm \sqrt{196}}{-12}$$

$$x = -1, \quad x = 1.33$$

~~now we need to find the coordinates~~

$$y = f(-1) = -2(-1)^3 + (-1)^2 + 8(-1) - 10 = -15, \text{ Coordinates} = (-1, -15)$$

$$y = f(1.33) = -2(1.33)^3 + (1.33)^2 + 8(1.33) - 10 = -2.3, \text{ Coordinates} = (1.33, -2.3)$$

Define Curvature:

$$f(-2) = -6(-2)^2 + 2(-2) + 8 = -20, -ve$$

$$f(0) = -6(0)^2 + 2(0) + 8 = 8, +ve$$

$$f(2) = -6(2)^2 + 2(2) + 8 = -12, -ve$$

Second Derivative:

$$f''(x) = -12x + 2$$

$$-12x + 2 = 0$$

$$\cancel{f''(x)} \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2(a)}$$

$$x = \frac{-0 \pm \sqrt{(0)^2 - 4(-12)(2)}}{2(-12)}$$

$$x = \frac{\sqrt{16}}{-24}$$

$$x = -0.167$$

$$y = f(-0.167)$$

$$y = -2(-0.167)^3 + (-0.167)^2 + 8(-0.167) - 10$$

$$y = -11.32, \text{ Coordinates} = (-0.167, -11.32)$$

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Define Curvature:

$$f(1) = -12(1) + 2 = -10, -ve$$

$$f(-1) = -12(-1) + 2 = 14, +ve$$

Curve Sketch:

