

SIT190 - SQUIRE - WEEK 8 - ONTRACK ASSESSMENT

TRIMESTER 1, 2024

1. DIFFERENTIATION

(1) Find the derivative of the following functions:

(a) $y = \frac{4x^5 - 7x^2 + 3x - 8}{x - 3}$

(b) $y = \ln(3x^3 - x^2 + 2)$

(c) $y = e^{3x} \cos(2x - 5)$

(2) The distance of a particle from a point O at time t seconds is given by

$$s = 2t^3 + 27t^2 + 105t - 50 \text{ metres for } t \geq 0.$$

(a) Find the velocity and acceleration at time t .

(b) Find the time(s) when the particle has a velocity of zero. Give the displacement and acceleration at these times.

(3) Find the stationary points of the function $y = x^3 + \frac{11}{2}x^2 - 4x + 31$.

- Use a sign diagram to classify each of the stationary points.
- Use the second derivative test to classify each of the stationary points.
- Explain which method you prefer and why.



SUBMISSION

In order to complete this task, you must submit the following:

- (1) The derivatives of these functions showing all working.
- (2) Showing all working, find:
 - (a): The velocity and acceleration showing all working.
 - (b): The time(s) when velocity is zero, and the displacement and acceleration at these times. Units must be given.

- (3) Identify the stationary points using the derivative including all working.
- Draw a sign diagram with all working. Classify each of the stationary points and explain how you used the sign diagram to do this.
 - Use the second derivative test to classify each stationary point. Show all working.
 - Explain which method you prefer and why in 1-4 sentences.

USEFUL RESOURCES

- Watch, Read and Think Section 7 (Section 7.4 shows two methods for classifying stationary points).
- Videos - Derivatives of polynomials, Applications of differentiation.
- Treasure Chest - Sign test - stationary points
- Watch, Read and Think Section 8 gives product, quotient and chain rules. Section 8.4 provides examples where more than one rule must be used. Section 8.5 gives examples of displacement, velocity and acceleration.
- Formula sheet