SIT190 - KNIGHT - WEEK 8-9 - ONTRACK ASSESSMENT

TRIMESTER 1, 2024

Task 1: Differentiation - rates of change

A tank is leaking. The amount of water in the tank after t days is $V = 4(49 - 3t)^3$ litres where $t \in [0, 28]$.

(1) What was the original amount of water in the tank, that is, the amount at $t = 0$?

(2) When does the amount of water reach an eighth of the original amount?

(3) What is the rate of change of V with respect to time t?
  (a) Evaluate this function when $t = 0$
  (b) Evaluate this function when t is your answer for question (2).
  (c) Compare your answers for question $(3)(a)$ and question $(3)(b)$. At which of these two times was the tank emptying at a greater rate? Explain why.

Task 2: Differentiation - sketching graphs

(1) Sketch the graph $y = 2x^3 + 5x^2 - 7x$. Provide all working for finding the intercepts and stationary points. You must use either a 2nd derivative test or a sign diagram to classify each stationary point.

1. Submission

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

(1) Task 1:
  • The answers (amount of water) for question (1) and question (2) including all working.
  • The function for question (3) and two evaluations of this function $((3)(a)$ and $(3)(b))$ including all working.
  • The time (either $t = 0$ or the solution to question (2)) and a sentence justifying your answer.

(2) Task 2:
  • Working for finding the stationary points and intercepts.
  • Working for classifying the stationary points.
  • Hand drawn sketch of graph with intercepts, x- and y-axis, origin and stationary points clearly marked.

<div align="center">

Useful resources

</div>

- Watch, Read and Think Section
- Hint: The rate of change of displacement with respect to time is $\frac{ds}{dt}$ so what is the rate of change of V with respect to time t?
- Hint: In Question 2, do not expand the cubic - use your index laws to remove the power of 3.
- Formula sheet

Sneak Peek

<div align="center">

2. Sneak Peek

</div>

If you have completed these Distinction tasks, you may be interested in attempting the High Distinction task. We give you a brief peek at what that task involves:

- Solving worded problems with differentiation
- Sketching graphs

Note: The Sneak Peek is **not** part of the Distinction On-Track task.

MAGI