SIT190 - SQUIRE - WEEKS 10-11 - ONTRACK ASSESSMENT

TRIMESTER 1, 2024

Integration

(1) A particle has an initial displacement of $s = 0$ when $t = 0$. The velocity of the particle is $v = 7t^2 - 53t - 402$ m/s ($t \geq 0$).
   (a) Find the displacement of the particle at time t.
   (b) Find the acceleration of the particle at time t.
   (c) What is the acceleration and displacement when $v = 0$?

(2) Evaluate $\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} (\sin(3x) - 27\cos(9x))dx$.

(3) Sketch the parabola $y = -15 + 3x - x^2$ and shade the area enclosed by the parabola and the x-axis. Find the area enclosed by this parabola and the x-axis using integration.

(4) Sketch the graphs of the line $y = 2 + x$ and the parabola $y = 2x^2 - 3x - 31$ on the same set of axis. Show all working including finding the x- and y-intercepts, and the co-ordinates where the two graphs intersect. Shade the area enclosed by the parabola and the line.

(5) Find the area between the line $y = 2 + x$ and the parabola $y = 2x^2 - 3x - 31$.

Submission

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

Q1(a-b): Find the functions for displacement and acceleration including all working.
Q1(c): Identify when velocity is 0, and find the acceleration and displacement at these times (include all working).
Q2: Show all working to find the definite integral.
Q3: Sketch the graph (hand drawn) and shade the area of interest. Show all working for finding the x- and y- intercepts.
Q4: A hand-drawn sketch of the graphs. Show all working including finding the intercepts and points of intersection. Shade the area enclosed between the parabola and line.
Q5: Find the area for shaded area in Q4 showing all working.

Useful resources

- Watch, Read and Think Sections 9 and 10.
  - Section 9.4 - how to use the indefinite integral to solve problems involving displacement, velocity and acceleration.
  - Section 10.3 - how to find the area using the definite integral.
- Formula Sheet
- Video - The Definite Integral
- Video - Integration Area Under the Curve.