

Question 1: A particle moves along a line with velocity function $v(t) = 3t^2 - 2t + k$ metres per second where k is a constant.

(a)[4] Determine k if the average velocity of the particle over the time period $[0, 5]$ is 15 metres per second.

(b)[2] Using the k value determined in (a), determine the total displacement of the particle over the time period $[0, 5]$.

(c)[4] Again using the k value determined in (a), is there a time $t_1 > 0$ at which the total displacement will be zero?

Question 2:

(a)[3] Determine $g'(1)$ where

$$g(x) = \int_{2x}^{3x+1} \sin(t^2\pi/4) dt$$

(b)[3] Determine $\int \tan x \ln(\cos x) dx$

(c)[4] Evaluate $\int_0^1 x\sqrt{1-x} dx$

Question 3 [10]: Evaluate $\int_0^1 (x^2 + 1)e^{-x} dx$

Question 4 [10]: Determine $\int x^3 \sqrt{9 - x^2} dx$

Question 5 [10]: Determine $\int \frac{25x}{(x-3)(x+2)^2} dx$