

This assessment assignment is intended to give an indication of your level of understanding of some basic manipulations in calculus so that I can advise you appropriately on how to be successful in this program. Please complete all the questions to the best of your ability and show your working.

1. Differentiate with respect to x

(a) $7x^2 - 3\ln x + 2e^x$

(b) $\sin(x^2)$

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

(d) $\ln\left(\frac{1+x}{1-x}\right)$

2. Integrate with respect to x

(a) $\int (x^2 + \cos x + 1/x) \, dx$

(b) $\int \frac{x}{x^2 + 1} \, dx$

(c) $\int x^2 e^x \, dx$

(d) $\int \sec^2 x \tan^2 x \, dx$

3. Find an expression in terms of a for the area enclosed by the curve with equation $y = x^2(a - x)$ and the x -axis between $x = 0$ and $x = a$.

4. The curve with equation

$$y = Ax + B + \frac{C}{x}$$

has a minimum at (1,4) and a maximum at (-1,0). Find the values of A, B, C .

5. The rate at which a transcontinental bus burns fuel is given by the formula

$$L(x) = \frac{1}{50} \left(\frac{400}{x} + \frac{x}{9} \right)$$

where $L(x)$ is the consumption in litres/kilometer and x is the speed in kilometers/hour.

If fuel costs 1.25 SF/litre, find, for a 500 km journey

(a) the speed that produces minimum cost.

(b) the minimum cost for the journey.

6. Find the first 4 terms in the Taylor expansion of $y = xe^{x^2}$ about the point $x = 0$.