

**Access to Science, Engineering and Agriculture:
Mathematics 2
MATH00040
Assignment 4**

Due Date: By 6.00pm on Wednesday 10/4/19

Show all your workings - part of overall mark

1. Find the following indefinite integrals.

(a) $\int (2x + 1)^{12} dx$

(b) $\int \frac{10x^4 - 8x^3 + 6x^2}{x^5 - x^4 + x^3 - 1} dx$

(c) $\int x^2 \cos(x^3 + 2) dx$

(d) $\int 2xe^{3x} dx$

(e) $\int x^2 \ln(x) dx$

(f) $\int \frac{-5}{x^2 + x - 6} dx$ (where $x > 2$).

(g) $\int \frac{3x^2}{(x^2 + x + 1)(x - 1)} dx$ (where $x > 1$).

2. Evaluate the following definite integrals.

(a) $\int_{-1}^1 x^3(3x^4 - 3)^8 dx$

(b) $\int_{\frac{\pi}{2}}^{\pi} \frac{4 \cos(x) + 6 \sin(x)}{2 \sin(x) - 3 \cos(x)} dx$

(c) $\int_0^1 (3x^2 - 2x)(x^3 - x^2 + 1)^{\frac{5}{2}} dx$

(d) $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin(x)e^{2\cos(x)} dx$

(e) $\int_{-\pi}^0 x \cos(x) dx$

(f) $\int_1^2 (x^3 + 1) \ln(x) dx$

(g) $\int_4^5 \frac{3x - 7}{x^2 - 4x + 3} dx$

(h) $\int_5^6 \frac{2x^2 - 3x + 5}{(x+1)^2(x-4)} dx$

3. (a) Find the area lying between the graph of $f(x) = x^5$ and the x -axis between the points $x = -1$ and $x = 1$.
- (b) Find the area lying between the graph of $f(x) = \sin(3x)$ and the x -axis between the points $x = 0$ and $x = \frac{\pi}{3}$.
- (c) Find the area lying between the graph of $f(x) = e^{\frac{x}{2}}$ and the x -axis between the points $x = 0$ and $x = 1$.
- (d) Find the area lying between the graph of $f(x) = x^3 - 2x^2 - 5x + 6$ and the x -axis between the points $x = 0$ and $x = 2$. Hint: The graph of this function only crosses the x -axis at $x = 1$ in the interval $[0, 2]$.
4. (a) Find the volume of revolution of the function $f(x) = x$ about the x -axis between $x = 0$ and $x = 1$ (note this is in fact the volume of a cone).
- (b) Find the volume of revolution of the function $f(x) = \sqrt{1-x^2}$ about the x -axis between $x = -1$ and $x = 1$ (note this is in fact the volume of a sphere of radius 1).
- (c) Find the volume of revolution of the function $f(x) = e^x$ about the x -axis between $x = 0$ and $x = 1$.
- (d) Find the volume of revolution of the function $f(x) = \sqrt{\cos(x)}$ about the x -axis between $x = 0$ and $x = \frac{\pi}{2}$.