EE106 – Engineering Mathematics I

Problem Set 3

Due by 5pm on Friday, 19 October 2018

1. Differentiate the following functions:

   (a) $2x^3 - 7x^2 + 3$

   (b) $2\left(x^{10} - 1\right)(x + 3)$

   (c) $\dfrac{x^4 + 22x^5 - 102x^2}{x - \frac{23}{x}}$

2. Prove that the second derivative of the product $f(x)g(x)$ is

   $$\frac{\mathrm{d}^2}{\mathrm{d}x^2}\left(f(x)g(x)\right) = f''(x)g(x) + 2f'(x)g'(x) + f(x)g''(x)$$

3. Find the derivatives of the following functions:

   (a) $\sin(x) - 3\tan(x)$

   (b) $[\sin(x)]^3$

   (c) $\dfrac{\tan(x)}{\sin(x)}$

4. Let $u(x) = [\sin(x)]^2$, $v(x) = [\cos(x)]^2$ and $w(x) = [\tan(x)]^2$.

   (a) Show the derivatives of $u(x) + v(x)$ and $v(x)w(x)/u(x)$ are both zero.

   (b) Explain why we should have known (a) was true before taking a single derivative.