MA1125 – Calculus
Tutorial problems #1

1. Find the domain and the range of the function f which is defined by

$$f(x) = \frac{4 - 3x}{6 - 5x}.$$

2. Find the domain and the range of the function f which is defined by

$$f(x) = \sqrt{x - x^2}.$$

3. Show that the function $f \colon (0, 1) \to (0, \infty)$ is bijective in the case that

$$f(x) = \frac{1}{x} - 1.$$

4. Express the following polynomials as the product of linear factors.

$$f(x) = 2x^3 - 7x^2 + 9, \qquad g(x) = x^3 - \frac{3x}{4} - \frac{1}{4}.$$

5. Use the addition formulas for sine and cosine to prove the identity

$$\tan(\alpha \pm \beta) = \frac{\tan \alpha \pm \tan \beta}{1 \mp \tan \alpha \cdot \tan \beta}.$$

6. Show that the function $f \colon (0, \infty) \to \mathbb{R}$ is injective in the case that

$$f(x) = \frac{2x - 1}{3x + 2}.$$

7. Find the roots of the polynomial $f(x) = x^3 + x^2 - 5x - 2$.

8. Determine the range of the quadratic $f(x) = ax^2 + bx + c$ in the case that $a > 0$.

9. Relate the sines and the cosines of two angles θ_1, θ_2 whose sum is equal to 2π.

10. Determine all angles $0 \le \theta \le 2\pi$ such that $2\cos^2 \theta + 7\cos \theta = 4$.