Assignment 1

1. Factorize $x^3 + 4x^2 + x - 6$ using the factor theorem. Hence solve the equation
   $x^3 + 4x^2 + x - 6 = 0$

2. Use the remainder theorem to find the remainder when $2x^3 + x^2 - 7x - 6$ is divided by
   (a) $(x - 2)$ (b) $(x + 1)$
   Hence factorize the cubic expression

3. Simplify $\frac{6x^2+7x-5}{2x-1}$ by dividing out

4. Solve the following inequalities:
   (a) $2 - 5x \leq 9 + 2x$ (b) $|3 + 2t| \leq 6$
   (c) $\frac{x-1}{3x+5} > 0$ (d) $(3t + 2)^2 > 16$
   (e) $2x^2 - x - 3 < 0$

5. Resolve the following into partial fractions
   (a) $\frac{x-11}{x^2-x-2}$ (b) $\frac{3-x}{(x^2+3)(x+3)}$
   (c) $\frac{x^3-6x+9}{x^2+x-2}$

6. Evaluate, correct to 3 decimal places,
   $$\frac{5e^{-0.982}}{3\ln 0.0173}$$

7. Solve the following equations, each correct to 4 significant figures:
   (a) $\ln x = 2.40$ (b) $3^{x-1} = 5^{x-2}$
   (c) $5 = 8(1 - e^{-\frac{x}{2}})$

8. The pressure p at height h above ground level is given by: $p = p_0 e^{-kh}$ where p_0 is the pressure at ground level and k is a constant. When p_0 is 101 kilopascals and the pressure at a height of 1,500m is 100 kilopascals, determine the value of k. Sketch a graph of p against h (p the vertical axis and h the horizontal axis) for values of height from zero to 12,000m when p_0 is 101 kilopascals

9. Evaluate correct to 4 significant figures:
   (a) $\sinh 2.47$ (b) $\tanh 0.6439$
   (c) sech 1.385 (d) cosech 0.874

10. The increase in resistance of strip conductors due to eddy currents at power frequencies is given by:
    $$\lambda = \frac{\alpha t}{2}\left[\frac{\sinh \alpha t + \sin \alpha t}{\cosh \alpha t - \cos \alpha t}\right]$$
    Calculate λ, correct to 5 significant figures, when $\alpha = 1.08$ and $t = 1$

11. If $A\text{ch}\ x - B\text{sh}\ x \equiv 4e^x - 3e^{-x}$ determine the values of A and B.

12. Solve the following equations:
    $$3.52\ \text{ch}\ x + 8.42\ \text{sh}\ x = 5.32$$
    correct to 4 decimal places