Answer all questions
Time: One hour

1. (a) i. Find the equation of a line passing through the point (1,1) and is perpendicular to the line $y = -2x + 2$.

   ii. Find x - intercept and y - intercept of the following lines:

   a. $y = 4x + 5$;
   b. $x + 2y = 12$;
   c. $x = 4 + 6y$.

   (b)

   $$\text{Let } A = \begin{pmatrix} -1 & -3 & 5 \\ 3 & 6 & -4 \\ -1 & -2 & 0 \end{pmatrix} \quad B = \begin{pmatrix} -2 & 1 & -5 \\ 7 & -1 & 3 \\ 0 & 5 & 9 \end{pmatrix} \quad \text{and } C = \begin{pmatrix} 3 & 0 & -2 \\ -3 & 5 & -1 \\ -2 & 7 & -5 \end{pmatrix}.$$

   Find the following matrices:

   a. $A - B + 3C$;

   b. AC.

   (c) Evaluate the following limits:

   i. $\displaystyle\lim_{x \to 4} \frac{x^2 - \sqrt{x}}{4 - x}$;

   ii. $\displaystyle\lim_{x \to \infty} \left[(x^2 + 1)^{1/2} - x \right]$.

2. (a) Differentiate the following functions with respect to variable x:

i. $y = (2x^2 + 7x)(4x^3 + 5x)$;

ii. $y = \dfrac{(3x^2 + 5x)}{(x^2 + 6x + 2)}$;

iii. $y = \dfrac{(4x^3 + 2x + 1)^4}{(3x^3 + 5x)^3}$;

iv. $y = (5x^3 + 2x + 6)^8$.

(b) Integrate the following with respect to variable x:

i. $(3x + 5)(2x - 3)$;

ii. $\dfrac{x^6}{(x^7 + 3)}$.