ASSESSMENT #2;

SECTION A

- Always keep your rough detailed working so that you can compare your solutions with those that will be sent to you. Also keep a copy of your answers/options. You may need it later.
- Show all the steps of your working and give your reasons clearly. Give a proper conclusion to your answers where applicable.

Question 1

State if the statement below is true, or false. If it is false, write the correct statement.

1.1 $\lim_{x\to a} f(x) = f(a)$. (2)

1.2 $\lim_{x\to a}(f(x) - g(x)) = \lim_{x\to a} f(x) + \lim_{x\to a} g(x)$. (2)

1.3 $\lim_{x\to c}(\frac{f(x)}{g(x)}) = \frac{\lim_{x\to a} f(x) - \lim_{x\to a} g(x)}{\lim_{x\to a} g(x)}$. (2)

1.4 $\lim_{x\to a} f(x) \cdot g(x) = (\lim_{x\to a} f(x))(\lim_{x\to a} g(x))$. (2)

1.5 $\lim_{x\to a} f(x)^n = (n-1)\lim_{x\to a} f(x)^{(n-1)}$. (2)

Question 2

Evaluate the following limits:

2.1 $\lim_{x\to 3}(x^3 + 2)(x^2 - 5x)$. (3)

2.2 $\lim_{x\to -4^-}(\frac{|x+4|}{x+4})$. (3)

Question 3

Let

$$f(x) = \begin{cases} x - 1 & \text{if } x < 3 \\ x^2 - 4x + 6 & \text{if } x \geq 2. \end{cases}$$

Determine

3.1 $\lim_{x\to 2^-} f(x)$. (2)

3.2 $\lim_{x\to 2^+} f(x)$. (2)

3.3 Show that $\lim_{x\to 2} f(x)$ exist. (2)

Question 4
Let $f(x)$ be a function and $b \in R$. f is continuous at $x = b$ if and only if :

4.1 ..... (1)

4.2 ..... (1)

4.3 ..... (1)

Hint: 4.1, 4.2, 4.3 require you to state the conditions that must be satisfied for f to be continuous at $x = b$

Question 5
Let

$$f(x) = \begin{cases} 4 - x^2 & \text{if } x > 1 \\ 3x^2 & \text{if } x < 1 \end{cases}$$

Determine whether or not $f(x)$ is continuous at $x = 1$. (5)

Question 6
Use the first principle to determine $f^l(x)$ of the following functions:

6.1 $f(x) = x^2$. (3)

6.2 $f(x) = x^2 - 4x + 7$. (3)

Question 7
Use the appropraite differentiation techniques to determine the $f^l(x)$ of the following functions (simplify your answer as far as possible):

7.1 $f(x) = (x^3 - 2x^2 + 5)(x^4 - 3x^2 + 2)$. (4)

7.2 $f(x) = (\frac{x-1}{x^4})^{\frac{1}{2}}$. (4)

7.3 $f(x) = (x^2 - 1)(\frac{x^3+3x^2}{x^2+2})$. (4)

Question 8
Differentiate the following with respect to the independent variables:

8.1 $y = ln|2t + 3| + lnt^t$. (4)

8.2 $g(t) = 2^{ln2t} + lne^{2t}$. (3)

[TOTAL: 55]

SECTION B

Question 1
A car moved distance S meters in a time t seconds, according to the formula $S = 3t^3 - 2t^2 + 4t - 1$. Determine:

1.1 velocity at (i) $t = 0, (ii) t = 1.5s$. (4)

1.2 Acceleration at (i) $t = 0, (ii) t = 1.5s$. (4)

Question 2
Let $f(x) = x^2 + 2x - 1$

2.1 Find the equation of the tangent at $x = 1$. (5)

2.2 Determine the equation of the normal to the tangent line at $x = 1$. (3)

Question 3
If $f(x) = \frac{x}{\sqrt{x^2+1}}$

3.1 Determine the equation of the tangent at $x = 1$. (6)

3.2 Determine the equation of the normal to the tangent line at $x = 1$. (3)

Question 4
Determine the derivative of the following functions with respect to the independent variables:

4.1 $y = xsinx$. (3)

4.2 $y = \frac{cos(2x)}{sin(4x)}$. (3)

Question 5
Use logarithm differentiation techniques to determine the y^l of the following functions:

5.1 $y = \frac{(lnx)(cos3x)}{x^2 sin3x}$. (4)

5.2 $y = \frac{e^{3t} sin(2t)}{5^t}$. (4)

Question 6
Determine the derivatives of the following inverse trigonometry functions

6.1 $f(x) = tan^{-1}\sqrt{x}$. (5)

6.2 $h(t) = \sqrt{t}cos^{-1(e^t)}$. (6)

[TOTAL: 50]