Math1210 Midterm 3 Extra Review

1. Evaluate
   (a) \( \int \left[ 2x^4(x^5-1)^{-2/3} \right] dx \)
   (b) \( \int \left[ 3^{2/3}t - \frac{4}{t^2} + 2t^3 - \sin t + 10 \right] dt \)
   (c) \( \int \frac{(2x+3)^2}{\sqrt{x}} \, dx \)
   (d) \( \int \left( 4x^2 - \cos x + \frac{3}{x^3} \right) \, dx \)
   (e) \( \int \frac{4x}{\sqrt{x^4-3}} \, dx \)
   (f) \( \int \left( 2x^3\sqrt{2x^4+3} \right) \, dx \)

2. Solve the following differential equation.
   \[ \frac{dy}{dx} = \frac{4x^3 + 1}{x^2} \]
   such that \( y = -1 \) when \( x = 1 \)

3. For the function \( f(x) = \frac{3x-2}{x-5} \) on the closed interval \([1, 4]\), decide whether or not the Mean Value Theorem for Derivatives applies. If it does, find all possible values of \( c \). If not, then state the reason.

4. Solve \( x^4 - 53 = 0 \) using Newton’s Method, accurate to four decimal places.

5. For \( f(x) = 3x^2 + 4x - 1 \) on \([0, 2]\), decide whether or not the Mean Value Theorem (for Derivatives) applies. If it does, find all possible values of \( c \). If not, then state the reason.

6. Solve this equation using (A) the Bisection Method and (B) Newton’s Method to three decimal places.
   \( f(x) = 2x^3 - 4x + 1 = 0 \) on \([0, 1]\)

7. Solve this differential equation.
   \[ \frac{dy}{dx} = \frac{x + 3x^2}{y^2} \]
   and \( y = 2 \) when \( x = 0 \)

8. Evaluate \( \sum_{i=1}^{10} [(i-2)(2i+5)] \)

9. Evaluate the definite integral using the definition (the tedious way).
   \[ \int_{-1}^{2} (5x - 1) \, dx \]

10. Evaluate \( \sum_{i=1}^{10} [(3i - 4)(i + 5)] \)

11. Evaluate the definite integral using the definition (the tedious way).
    \[ \int_{0}^{3} (4x^2 - 1) \, dx \]