

### Math1210 Midterm 3 Extra Review

1. Evaluate

(a)  $\int (2x^4(x^5-1)^{-2/3}) dx$

(b)  $\int \left( 3\sqrt[5]{t} - \frac{4}{t^2} + 2t^3 - \sin t + 10 \right) dt$

(c)  $\int \frac{(2x+3)^2}{\sqrt{x}} dx$

(d)  $\int (4x^5 - \cos x + \sqrt[3]{x^2}) dx$

(e)  $\int \frac{4x}{\sqrt{x^2-3}} dx$

(f)  $\int (2x^3\sqrt{2x^4+3}) dx$

2. Solve the following differential equation.

$$\frac{dy}{dx} = \frac{4x^3 + \frac{1}{x^2}}{3y^4} \quad \text{such that } y = -1 \text{ when } x = 1$$

3. For  $f(x) = x^2 + \frac{2}{x}$

(a) Find all asymptotes, if they exist.

(b) Fill in the sign line for  $f'(x)$

(c) Find all local minimum and maximum points, if they exist, or state that they DNE.

(d) Find the global minimum and maximum points, if they exist, or state that they DNE.

(e) Fill in the sign line for  $f''(x)$

(f) Find all inflection points, if they exist, or state that they DNE.

(g) Sketch the graph of  $f(x)$ .

4. 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.

5. Solve  $x^4 - 53 = 0$  using Newton's Method, accurate to four decimal places.

6. 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.

7. Solve this equation using (A) the Bisection Method **and** (B) Newton's Method to three decimal places.

$$f(x) = 2x^3 - 4x + 1 = 0 \quad \text{On } [0, 1]$$

8. Solve this differential equation.

$$\frac{dy}{dx} = \frac{x + 3x^2}{y^2} \quad \text{and } y = 2 \text{ when } x = 0$$

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

10. Evaluate the definite integral **using the definition** (the tedious way).

$\int_{-1}^2 (5x-1) dx$  . (Note: Here is the definition.  $\int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \Delta x$  )

$\Delta x =$  \_\_\_\_\_

$x_i =$  \_\_\_\_\_

$\sum_{i=1}^n f(x_i) \Delta x =$  \_\_\_\_\_

Answer: \_\_\_\_\_

11. Find  $G'(x)$  given  $G(x) = \int_4^x x^3(t^2-2) dt$

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

13. Evaluate the definite integral **using the definition** (the tedious way).  $\int_0^3 (4x^2-1) dx$  .

14. Find  $G'(x)$  given  $G(x) = \int_3^{\tan x} (t^3 - \sin(t^2)) dt$