Final Exam: Practice 1

Name:

- *Basic Calculators are allowed. Graphic calculators are not allowed.*
- *A page of formula is allowed. Only formulas are allowed on the page. The page will be checked during the exam.*

Problem 1

Use the definition of derivatives to find $f'(x)$, and then find the tangent line to the graph of $y = f(x)$ at $x = 1$

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

Problem 2

Find $f'(x)$.

$$f(x) = \frac{2x^3}{3} + \frac{x^5}{7} - \frac{2}{\sqrt[3]{x}} + \frac{5}{6\sqrt{x}} + 2024$$

$$f(x) = (\sqrt{x} + 1)(x + 1)$$

$$f(x) = \frac{x-1}{x+1} \text{ (Simplify your answers.)}$$

$$f(x) = x \sin x$$

$$f(x) = \frac{x}{\tan x}$$

$$f(x) = \cos^{2024} x$$

$$f(x) = \cos(3x^2 + x + 1)$$

$$f(x) = \tan\left(\cos x + \sqrt{x}\right)$$

$$f(x) = \left(\cos x + \sin x \right)^{2024}$$

$$f(x) = 2024^x + 7^x - 2\log_9 x + 3\ln x - \frac{3\log_2 x}{5} + \frac{\log_7 x}{3} + 2024$$

$$f(x) = \log_7 \left(\sqrt{x} + x^2 + x + 1 \right)$$

$$f(x) = e^{\sin x + \tan x + 2x^3}$$

$$f(x) = e^{x \sin x}$$

Problem 3

$$y + xy - 2x^3 = 1$$

(a) Find dy/dx or y' by differentiating implicitly.

(b) Solve the equation for y as a function of x, and find dy/dx from that equation.

(c) Write an equation for the tangent line at the point (0, 1)

Problem 4

(a) Find the local linear approximation of $f(x) = \sqrt{x}$ at $x_0 = 1$

(b) Use the local linear approximation obtained in part (a) to approximate $\sqrt{1.1}$

Problem 5

Given that

$$f(x) = x^3 - 3x^2 + 1$$

Find all the intervals where

a. $f(x)$ is increasing
b. $f(x)$ is decreasing
c. $f(x)$ is concave upward
d. $f(x)$ is concave downward

Problem 6

Find all the relative extrema of

$$f(x) = x^4 - 12x^3$$

Problem 7

Find the absolute maximum and absolute minimum of $f(x) = x^3 - 6x^2 + 9x + 1$ on the interval $[5, 7]$.

Problem 8

The given equation has one (real) solution. Approximate the solution by Newton's method.

$$x^3 - 2x - 2 = 0$$

Problem 9

Find the following

$$\int \left(x^7 - 2x^6 + 2x + 2024\right) dx$$

$$\int \left(\sqrt{x} + x + \frac{1}{x}\right) dx$$

$$\int \left(2^x + 2\sin x - 3\cos x + 1\right) dx$$

$$\int (x+1)(x+2)dx$$

Problem 10

Calculate the area between $f(x) = x^2 - 4x + 3$ and x-axis bounded by $x = 0$ and $x = 2$