

Final Exam

Name: _____

StudentID: _____

Major: _____

Time: 120 minutes.

Date: Tuesday, 3rd March 2011.

Justify your solutions and show all your steps. Write down the formulae used.

Number	1	2	3	4	5	6	7	8	9	10	Σ
Possible Points	8	8	8	8	8	8	8	8	8	8	80
Points											

1. Find each limit if it exists:

(a) $\lim_{x \rightarrow 3} \frac{x^2 - 16}{x - 3}$

(b) $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$

2. Is the following function continuous? Justify.

$$y = \begin{cases} x^4 - 3 & \text{if } x \leq 1 \\ 2x - 3 & \text{if } x > 1 \end{cases}$$

3. Define the derivative for a continuous function.

4. If $\frac{d^2 y}{dx^2} = \frac{x}{x^2+1}$ find $\frac{d^4 y}{dx^4}$

5. Find any relative maxima, minima, zeros, points of inflection and sketch the graph. Hint: $\sqrt{3} \approx 1.7$.

$$y = x^3 - 12x.$$

6. Evaluate the integrals. Use substitution if necessary:

(a) $\int \frac{x^2 dx}{x^3 + 1}$

(b) $\int \left(\frac{e^{2x}}{2} + \frac{2}{e^{2x}} \right) dx$

7. Find the general solution for the differential equation

$$\frac{dy}{dx} = \frac{x}{e^y}$$

8. Find the area between the curve $y = -x^2 - 3x - 1$ and the x -axis from $x = 1$ to $x = 2$.

9. Evaluate the integrals. Use integration by parts if necessary.

(a) $\int_3^3 \frac{\sqrt{x^3-x}}{\sqrt{x^3+1}} dx$

(b) $\int x^2 \ln x dx$

(c) $\int_1^\infty \frac{dx}{x}$

10. If $z = e^{xy}$ find each of the four second partial derivatives.