

## Midterm #2

**Name:** \_\_\_\_\_

**StudentID:** \_\_\_\_\_

**Major:** \_\_\_\_\_

**Time:** 60 minutes.

**Date:** Thursday, 17<sup>th</sup> March 2011.

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

Number	1	2	3	4	5	$\Sigma$
Possible Points	10	7	8	5	10	40
Points						

1. Let  $f(x) = x^3 - 3x$ . Let  $G_f$  be its graph. The goal is to sketch the graph. Hint:  $\sqrt{3} \sim 1.7$
- (a) Find the first three derivatives of the function.
  - (b) Find the  $y$ -intercepts and the  $x$ -intercepts (zeros).
  - (c) Find the zeros of the first derivative.
  - (d) Use this to find critical points. Determine if they are maxima or minima or neither.
  - (e) Determine where the graph is increasing and where decreasing.
  - (f) Find the zeros of the second derivative.
  - (g) Use this to find possible inflection points. Use the third derivative to make sure you really found an inflection point.
  - (h) Determine by using the first derivative if it's a saddle point.
  - (i) Use your information to graph the function.

Continued.

2. Find the horizontal and vertical asymptotes for

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

3. Find the derivative of

$$y = \frac{e^x - e^{-x}}{e^x + e^{-x}}.$$

4. Find the slope of the tangent at  $(2, 2)$  to the curve

$$x^2 - 4x + 2y^2 - 4 = 0.$$

5. The area of a circle is changing at a rate of  $1\text{cm}^2/\text{sec}$ . At what rate is its radius changing when the radius is 2 cm? Hint: The area of a circle is given by  $r^2\pi$ .