Math 2310 - Practice Test 3

1 Graphing a Function

1. For the following functions compute the first derivative number line and state the intervals of increasing and decreasiing in interval notation.

   (a) $f(x) = x^3 - 3x + 7$

   (b) $f(x) = e^{x^3 - x}$

   (c) $f(x) = 3x^{2/3} - 16x + 5$

   (d) $f(x) = \frac{x^2+1}{x+4}$

2. For the following functions find the maxima and minima. Use the first derivative number line to classify your critical points.

   (a) $f(x) = x^3 - 3x + 7$

   (b) $f(x) = (2x)^x$ on the interval of $[0.1, 1]$

   (c) $f(x) = xe^x$

   (d) $f(x) = \cos^2(x)$ on the interval of $[0, 2\pi]$

   (e) $f(x) = x - 2\arctan(x)$

3. For the following functions find the maxima and minima. Use the second derivative number line to classify your critical points.

   (a) $f(x) = x^3 - 3x + 7$

   (b) $f(x) = x\sqrt{2 - x^2}$

   (c) $f(x) = \frac{x^2+1}{x+4}$

4. For the following functions graph the function. Include the first derivative number line, the second derivative number line and the coordinates of the critical points and points of innflection.

   (a) $f(x) = x^3 - 3x + 7$

   (b) $f(x) = x\ln(x)$

   (c) $f(x) = xe^x$

   (d) $f(x) = e^{x^3 - x}$

   (e) $f(x) = \frac{x^2}{x-2}$

2 Optimization Problem

- Problems from book in section 4.4: 5,6,7,8,9,10,11

3 Limits - Using L'Hopital's Rule

- See the limit worksheet for problems

4 Antiderivatives

1. $\int x^3 + e^x + 1\,dx$
2. $\int \cos(x) - \sin(x)\,dx$
3. $\int \frac{2x^3+3x^2-15}{x}\,dx$
4. $\int \frac{1}{1+x^2}\,dx$
5. $\int 7\sec^2(x) - 5\sec(x)\tan(x)\,dx$

Our list of antiderivatives that we have memorized:

$\int k\,dx = kx + C$ $\int e^x\,dx = e^x + C$	$\int x^p\,dx = \frac{x^{p+1}}{p+1} + C$ if $p \neq -1$ $\int \frac{1}{x}\,dx = \ln(x) + C$
$\int \cos(x)\,dx = \sin(x) + C$ $\int \sec^2(x)\,dx = \tan(x) + C$ $\int \sec(x)\tan(x)\,dx = \sec(x) + C$ $\int \frac{1}{\sqrt{1-x^2}}\,dx = \sin^{-1}(x) + C$	$\int \sin(x)\,dx = -\cos(x) + C$ $\int \csc^2(x)\,dx = -\cot(x) + C$ $\int \csc(x)\cot(x)\,dx = -\csc(x) + C$ $\int \frac{1}{1+x^2}\,dx = \tan^{-1}(x) + C$