HOMEWORK 1 - MATH 152 DUE DATE: Thursday, September 9 **INSTRUCTOR:** George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each homework problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

- 1. Find the following limits
 - (a) $\lim_{x \to 1} \frac{x^2 + x 2}{x^2 + 4x 5}$ (b) $\lim_{x \to +\infty} \frac{e^x}{x^2}$.

(b)
$$\lim_{x \to +\infty} \frac{c}{x^2}$$

- 2. Let $f(x) = \begin{cases} x^2 + 1 & \text{if } x \le 1 \\ e^{-x} + 3 & \text{if } x > 1 \end{cases}$ Find $\lim_{x\to 1} f(x)$, $\lim_{x\to -\infty} f(x)$ and $\lim_{x\to +\infty} f(x)$
- 3. Use the definition of the derivative to compute the value of the derivative of the function $f(x) = \frac{1}{x-2}$ at x = 3.
- 4. Compute the following derivatives

(a)
$$f(x) = x^2 e^x$$

(b) $g(x) = \frac{2x-1}{x+5}$

- 5. Find the point (x, y) on the graph of the function $f(x) = \sqrt{x}$, where the tangent is parallel to the secant that cuts the graph at x = 0 and x = 4.
- 6. Use the first and second derivatives (the sign table method) to sketch the graph of the function $f(x) = x^3 - 6x^2 + 6$. (Please, label all points of interest.)
- 7. Evaluate the following indefinite integrals:

 $\cos x dx$

(a)
$$\int (2+y^2)^2 dy$$

(b) $\int \frac{1-2t^3}{t^3} dt$
(c) $\int [\frac{1}{2t} - \sqrt{2}e^t] dt$
(d) $\int \sec x (\tan x + t) dt$

- (e) $\int \frac{\sin 2x}{\cos x} dx$
- 8. Use substitution to evaluate the indefinite integral and then the fundamental theorem of calculus to evaluate the following definite integrals:

(a)
$$\int_{1}^{2} (4x - 2)^{3} dx$$

(b) $\int_{-5}^{0} x \sqrt{4 - x} dx$

(c)
$$\int_0^{\pi/6} 2\cos 3x dx$$

(d) $\int_0^{\ln 5} e^x (3 - 4e^x) dx$