EXAM 3 - MATH 151
DATE: Friday, March 19
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 3 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.
GOOD LUCK!!

1. Find a formula for $f^{-1}(x)$ and state the domain of f^{-1} if $f(x) = 2x - x^2$, $x \geq 2$.

2. Find the domain of the function $f(x) = \log_3 \frac{x^2 - x - 2}{x^2 - x - 6}$.

3. Compute the derivative $\frac{dy}{dx}$

   (a) $y = e^{x \sin x}$

   (b) $y = \ln(x^2 \cos y)$

   (c) $y = \frac{e^x}{\ln x}$

   (d) $y = x(\cos^{-1} x)^2$

4. Find the equation of the tangent line to the graph of $y = (x^3 + 1)^{\ln x}$ at $x = 1$.

5. Find the limits

   (a) $\lim_{x \to +\infty} \frac{e^x}{1 - \ln \frac{1}{x}}$

   (b) $\lim_{x \to +\infty} x^3 e^{-x}$

   (c) $\lim_{x \to 0} (e^{2x} + 3x)^{1/x}$

6. Create the table of study for the function $f(x) = x^2 e^{-x}$ and then roughly sketch its graph.

These formulas are offered courtesy of George® for your perusal:

1. $(\sin^{-1} x)' = \frac{1}{\sqrt{1-x^2}}, -1 < x < 1$

2. $(\cos^{-1} x)' = \frac{-1}{\sqrt{1-x^2}}, -1 < x < 1$

3. $(\tan^{-1} x)' = \frac{1}{1+x^2}, -\infty < x < \infty$

4. $(\sec^{-1} x)' = \frac{1}{|x|\sqrt{x^2-1}}, 1 < |x|$