Please provide complete and well-written solutions to the following exercises.

Due August 29, at the beginning of class.

# Assignment 1

**Exercise 1.** Let $f(x) = e^{x^2}$. Find the equation of the tangent line to $f$ at $x_0 = 1$.

**Exercise 2.** Differentiate $f(x) = e^{(x^2+3x+2)^2}$.

**Exercise 3.** Let $f(x) = x^2 e^x$. Find the critical points of $f$. Classify these critical points as local maxima, local minima, or neither.

**Exercise 4.** Let $j$ be a positive integer. Let $f(x) = x^j e^x$. Find the critical points of $f$. Classify these critical points as local maxima, local minima, or neither.

**Exercise 5.** Evaluate the integral

$$\int_0^5 e^{-10y} dy.$$

**Exercise 6.** Evaluate the integral

$$\int_1^3 y e^{3y^2} dy.$$

**Exercise 7.** Let $f(x) = x^2 - 2x$, where $f$ has the domain $x \geq 1$. Find a formula for $f^{-1}$, and then plot both $f$ and $f^{-1}$.

**Exercise 8.** Let $f(x) = 5 - 4x$. Graph $f$ and $f^{-1}$ together. Evaluate $f'(x)$ at $x = 1/2$, evaluate $(f^{-1})'(x)$ at $x = f(1/2)$, and verify that $1/f'(1/2) = (f^{-1})'(f(1/2))$.

**Exercise 9.** Show that the function $f(x) = (1-x)^3$ has an inverse on the domain $(-\infty, \infty)$. Find a formula for the derivative of this inverse.

**Exercise 10.** Let $f(x) = \sqrt{x^2 + 6x}$, where $f$ has the domain $x \leq -6$. Let $g$ be the inverse of $f$. Compute $g'(4)$.