Week 7: Assignment 7

A. Let $f(x) = x^2 - 2x + 1$. Compute $f(2)$ and $f(-2)$.

B. Solve the following system of equations for $x$ and $y$:

\[
\begin{align*}
3x + 2y &= 7 \\
4x - y &= 5
\end{align*}
\]

C. Which of the following is true?

1. $\frac{1}{0}$ is undefined.
2. $\frac{0}{0}$ is undefined.
3. $\frac{0}{x}$ is undefined for all $x$.

D. Suppose $f(x) = 2x + 3$ and $g(x) = x^2 - 1$. Compute $(f \circ g)(1)$.

E. Prove that if $a$ and $b$ are real numbers, then $a^2 + b^2 \geq 0$.

F. Simplify the following expression:

\[
\frac{1}{x} + \frac{1}{y}
\]

G. Evaluate the definite integral $\int_{0}^{1} x^2 \, dx$.

H. Find the point on the parabola $y = x^2$ that is closest to the line $y = x$.

I. A point moves along the line $y = 2x + 1$ with velocity $\mathbf{v}(t) = \langle 3t, 6t \rangle$. Find the position vector of the point at time $t$.

J. Suppose $f(x) = x^2 - 1$. Find the linearization of $f(x)$ at $x = 2$.

K. Prove that if $a$ and $b$ are positive numbers, then $a^b > b^a$ whenever $a > b$.

L. Find the derivative of $f(x) = x^3 - 2x^2 + 3x - 4$.

M. Evaluate the limit $\lim_{x \to 0} \frac{x^2}{x}$.

N. Suppose $f(x) = e^x$. Find the derivative of $f(x)$ at $x = 0$.

O. Suppose $f(x) = \ln(x)$. Find the derivative of $f(x)$ at $x = 1$.

P. Evaluate the definite integral $\int_{0}^{\pi} \sin(x) \, dx$.

Q. Suppose $f(x) = \cos(x)$. Find the derivative of $f(x)$ at $x = \pi/2$.

R. Evaluate the definite integral $\int_{-1}^{1} x^4 \, dx$.

S. Suppose $f(x) = x^{1/3}$. Find the derivative of $f(x)$ at $x = 0$.

T. Evaluate the definite integral $\int_{1}^{4} \frac{1}{x} \, dx$.

U. Suppose $f(x) = \sqrt{x}$. Find the derivative of $f(x)$ at $x = 1$.

V. Evaluate the definite integral $\int_{0}^{\infty} e^{-x} \, dx$.

W. Suppose $f(x) = \sin^{-1}(x)$. Find the derivative of $f(x)$ at $x = 0$.

X. Evaluate the definite integral $\int_{0}^{1} e^x \, dx$.

Y. Suppose $f(x) = \ln(x)$. Find the derivative of $f(x)$ at $x = 1$.

Z. Evaluate the definite integral $\int_{0}^{1} \frac{1}{x^2} \, dx$.