# Portfolio

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## Purpose

Throughout this course, you will work through a few prompts and collect them together in a course portfolio. These prompts represent key topics in this course. As you progress through the course, you will add to this portfolio and also have an opportunity to go back and edit any previous responses. By the end of the term, you will have a portfolio of work that demonstrates your understanding of this course.

## Assignment

This portfolio will be worth 100 points throughout the term. Each prompt will be given at the beginning of the course, but you will not be able to complete them until you progress through certain topics in the course. For any individual prompt, you can submit it for corrections and critiques, and you will receive feedback to assist you in editing your response.

Your response to each prompt should adhere to these guidelines:

- Each prompt will begin on a new page.
- The instructions for the prompt are written before any work is shown.
- Any computations are fully worked out without the aid of a calculator or computer.
- Any work that is unclear is justified with full sentences.
- The conclusion is written as the end of the response.
- Any values are given exactly, unless rounding is specifically asked for.
- Proper notation is always given.

# Prompts

## Prompt 1

Evaluate $\lim_{\theta \to 0} \dfrac{1 - \cos 3\theta}{1 - \cos 2\theta}$.

## Prompt 2

You have 2000 feet of fencing materials and wish to build a fence around a rectangular region that borders a river. Assuming that no fence must be built along the river, what are the dimensions of the region that has the largest area?

## Prompt 3

Find the antiderivative of $f(x) = \dfrac{1}{1+x^2} - \dfrac{2}{x} + x^3 - 1$ that passes through the point $\left(-1, \frac{-\pi}{4}\right)$.

## Prompt 4

Find the average value of $f(x) = x^2 + \sqrt{x}$ on the interval $[1, 4]$.

## Prompt 5

Let $R$ be the region above the $x$-axis, beneath the graph of $y = \dfrac{2}{x \ln x}$, to the right of $x = 2$, and to the left of $x = e$.

1. Draw $R$ on a Cartesian plane. Be sure to label your axes, draw tick marks and provide a scale, and label the curves.
2. Write an integral that represents the exact value of the area of $R$.
3. Find the exact value of the area of $R$.

## Prompt 6

Evaluate $\displaystyle\int x^2 \cos(2x)\ dx$.

## Prompt 7

Find the most general antiderivative of $f(t) = \dfrac{2t - 1}{2t^2 - 5t - 3}$.

## Prompt 8

Let $R$ be the region bounded by the curves $y = \csc(x)$, $y = \ln(x)$, $x = 1$, and $x = 2$. Let $A$ be the area of $R$.

1. Write an integral to represent the exact value of $A$.
2. Use the Trapezoid Rule with $n = 6$ to approximate the integral you wrote in part (a). Round your conclusion to the nearest thousandth.