Homework 3

Due Friday, October 21, 2022 at 11:59PM on Gradescope

Each homework is worth 30 points. Some problems will be graded for completion, and others will be graded for accuracy and quality of explanations. You must show work to receive full credit. Challenge problems are **optional** and go beyond what you are expected to know for exams. They may be completed for an additional 3 points each, and partial credit will be awarded.

Required Problems:

- 5.5: 21,22,24,25,27,36,37,41,43,44,47,56
- 5.6: 2a,3a,4a,10a, [13th edition: 42,43,51,52,53,78,82] [14th/15th edition: 66,67,75,76,77,108,112]
- 6.1: 1,2,5ab [13th edition: 15,16,33,35,36,37,47] [14th/15th edition: 17,18,39,41,42,43,53]

1. Show that the volume V of a sphere of radius r is $V = \frac{4}{3}\pi r^3$ by revolving the region bounded by a semicircle of radius r and the line $y = 0$ about the x-axis.
2. Show that the volume V of a cone of radius r and height h is $V = \frac{1}{3}\pi r^2 h$ by revolving the region bounded by the lines $y = mx$, $y = 0$, and $x = h$ about the x-axis. (You have to figure out what m needs to be.)

Challenge problems:

A) Show that the volume V of a regular octahedron with side length s is $V = \frac{\sqrt{2}s^3}{3}$ by integrating cross-sectional areas.

B) Show that the volume V of a regular tetrahedron with side length s is $V = \frac{s^3}{6\sqrt{2}}$ by integrating cross-sectional areas. One way to set it up is by placing a vertex at the origin and having the x-axis pass through the center of the tetrahedron, then integrating from $x = 0$ to $x = h$, the height of the tetrahedron.