MATH 163 —HOMEWORK # 6 : ANSWERS to some problems

Note: in most cases we DO NOT show all the work necessary to obtain the answer. You need to show all work.

Solutions Day 15:

1. The figure on left shows base with projection of a slice of the volume with width \( \Delta x \). The figure at right shows that slice, approximated by a cube with volume

\[
\Delta V = (2y)^2 \Delta x
\]

Summing all the slices and taking the limit as \( \Delta x \to 0 \) get

\[
\text{Volume} = \int_{-5}^{5} (2y)^2 \, dx = 4 \int_{-5}^{5} (25 - x^2) \, dx = 2000/3
\]

2. 24

3. Volume = \( \frac{\sqrt{3}}{2} \int_{0}^{1} \frac{(1-y)^2}{2} \, dy = \sqrt{3}/12 \) (easiest with substitution \( u = 1 - y \))

Solutions Day 16:

1. (a) (p 219, #7) see book
   (b) (p 219, #11) \( f \) is continuous on \([-1,1]\) and differentiable on \((-1,1)\) (since polynomial) so MVT applies. \( f'(c) = 6c + 2 = (f(1) - f(-1))/(1 - (-1)) = 2 \) at \( x = 0 \).
   (d) (p 219, #24) By MVT: \( f(8) - f(2) = f'(c)(8 - 2) \), some \( c \). Since \( 3 \leq f'(c) \leq 5 \) it follows that \( 3(8 - 2) \leq f'(c)(8 - 2) \leq 5(8 - 2) \). Thus \( 18 \leq f(8) - f(2) \leq 30 \).

2. (a) \( \frac{8}{27}[\sqrt{1000} - \frac{1}{8}\sqrt{13^3}] \approx 7.64 \)
   (b) same as (a) (use substitution \( x = y - 1 \))
   (c) \( \sinh 1 = (e - 1/e)/2 \)

3. 21/16

Solutions Day 17:

3. 60 lb-in = 5 lb-ft
(For all others see book)