MAT 115 Worksheet 17 (Mock Final Exam)
Thursday, Nov 30 2017

Important info: Welcome to the last MAT 115 workshop! My name is **Diego Avalos** (avalosgalvez@cpp.edu), and I will be your workshop facilitator. Today's worksheet is meant to serve as a **mock final exam**. All worksheets and solutions may be found at the website **www.diegoavalos.net/teaching/mat115workshop2017**.

1. A 2000-liter cistern is empty when water begins flowing into it (at time $t = 0$) at a rate (in L/min) given by $Q'(t) = 3\sqrt{t}$, where t is measured in minutes.
   (a) How much water flows into the cistern after 1 hour 4 minutes?
   (b) When will the tank be full?
2. Compute the following integrals
   (a) $\displaystyle\int \cot^3 x \csc^3 x \, dx$ (b) $\displaystyle\int \frac{1}{x^3 + x} \, dx$ (c) $\displaystyle\int_0^1 x\sqrt[4]{4 - x^2} \, dx.$
3. Find the volume of the solid whose base is the region bounded between the curves $y = \sqrt{x}$ and $y = \frac{1}{\sqrt{x}}$ for $1 \leq x \leq 4$ and whose cross sections taken perpendicular to the x-axis are squares.
4. The region bounded by the graphs of $x = 0$, $x = \sqrt{\ln y}$, and $x = \sqrt{2 - \ln y}$ in the first quandrant is revolved about the y-axis. What is the volume of the resulting solid?
5. Consider the function $f(x) = x^{1/2} - \dfrac{1}{3}x^{3/2}$ on the interval $[1, 3]$.
   (a) Find the arclength of the function over the specified interval.
   (b) Find the area of the surface generated when the graph of the function is revolved about the x-axis.
6. Integrate
$$\int \frac{\arcsin x}{x^2} \, dx.$$