MATH 3B Final practice problems

---

1. A honeybee population starts with 100 bees and increases at a rate of $n'(t)$ bees per week. What does $100 + \int_0^4 v'(t)\ \mathrm{d}t$ represent?

2. Compute the following:

   (a) $\int e^{-x} \cos(2x)\ \mathrm{d}x$

   (b) $\int \frac{1+x^2}{\sqrt{3x+x^3}}\ \mathrm{d}x$

   (c) $\int \cos(\sqrt{x})\ \mathrm{d}x$

   (d) $\frac{d}{dx}\int_x^{x^2} t^3\ \mathrm{d}t$

   (e) $\int \frac{(ln(x))^3}{x}\ \mathrm{d}x$

   (f) $\int \frac{x^3-\sqrt{x}}{x^2}\ \mathrm{d}x$

   (g) $\int \sin^3(x)\cos^2(x)\ \mathrm{d}x$

   (h) $\int_0^1 \frac{4}{4x-1}\ \mathrm{d}x$

   (i) $\int \frac{1}{x^2-1}dx$

3. Consider the region $R = \{(x,y) : x \geq 1, 0 \leq y \leq 1/x\}$.

   (a) Show that the region R has infinite area.

   (b) Find the volume of the solid obtained by rotating R about the x-axis. It is finite, which is kinda crazy given part (a), huh?

4. Find the work required to lift a chain lying on the ground to a height of 10 feet if the chain weighs 20 pounds and is 10 feet long.

5. Evaluate $\int_0^\infty \frac{1}{x-2}\ \mathrm{d}x$ or show that the integral diverges.

6. Find the volume of the solid obtained by rotating the region bounded by the curves $y = 2x$ and $y = x^2$ about the x-axis.

7. Let $f(x) = x^2$. Approximate $\int_0^4 x^2\ \mathrm{d}x$ using a right hand Riemann sum and 4 subintervals.