

## Math 1A Worksheet 30

November 26th, 2007

1. If  $w'(t)$  is the rate of growth of a child in pounds per year, what does  $\int_5^{10} w'(t) dt$  represent?
2. Suppose a population has size 10 at time  $t = 0$  and grows with a doubling time of 1 year.
  - a) Find the size of the population after 10 years.
  - b) Find the average size of the population between times  $t = 0$  and  $t = 10$  years. [Note: knowing the correct definition of the average here is the *whole point* of this problem. So please be sure you know.]
3.
  - a) Explain in words the difference between “displacement” and “distance traveled.”
  - b) Suppose a particle moves with velocity  $v(t)$ , which varies continuously over time. Use the fundamental theorem of calculus to write both the displacement and distance traveled by the particle as functions.
  - c) Write  $s(t)$  for the position of the particle at time  $t$ . We decided before that the average velocity between times  $a$  and  $b$  is  $\frac{s(b)-s(a)}{b-a}$ . Using the FTC, show that this agrees with the answer you get if you use the “integral definition” of the average.
4. Let  $g(x) = \int_{-1}^x |t| dt$ .
  - a) Find an explicit formula for  $g(x)$  for  $-1 < x < 0$  and  $0 < x < 1$ .
  - b) Graph  $g(x)$  for  $-1 < x < 1$ .
  - c) Find  $g'(x)$  and  $g'(0)$ .
  - d) Does  $g''(0)$  exist?

5. Suppose

$$y = \int_{\cos x}^{x^2} \cos(u^2) du.$$

Find  $\frac{dy}{dx}$ .

6. If  $f$  is a continuous function and  $g$  and  $h$  are differentiable functions, find

$$\frac{d}{dx} \int_{g(x)}^{h(x)} f(t) dt.$$

7. Find

$$\lim_{t \rightarrow 0^+} \int_t^1 t \frac{\cos y}{y} dy.$$