

**MATH 1325 Test 2**

Name: \_\_\_\_\_

1. Suppose that currently, at year  $t = 0$ , your annual income is \$61,000, and that every year your income is growing at a rate of 5.2% per year.

- (a) Express your average income from year  $t = 3$  to year  $t = 22$  using an integral.
- (b) Compute this average income. (A calculator is recommended!)

2. For the integral  $\int_1^2 (4x - 5)^{12} dx$ , it is not fun to expand the large power

$$(4x - 5)^{12} = (4x)^{12} - 12(4x)^{12-1}(5) + \frac{12(12-1)}{2}(4x)^{12-2}(5)^2 - \dots .$$

Show steps for the computing the integral an easier way: with a  $u$ -substitution.

**3.** Suppose that if you sell haircuts at unit price  $p$ , then  $x = 1224 - 53p$  haircuts are demanded each week. Further suppose that it costs  $140 + 8x$  to perform  $x$  haircuts per week.

- (a) Express weekly profit as a function  $P = f(p)$  of unit price.
- (b) Find the derivative  $dP/dp$ .
- (c) At what price is weekly profit maximized?

