

Economics 100b, Fall 2005
 Sample Midterm Question Answers
 Chapter 3

- 1) The constant growth rule is that $y_t = y_0(1 + \bar{g})^t$ if y grows at constant rate \bar{g} . In this example, we are working *backwards*—we know the growth rate, \bar{g} , the time period, t , and the current value of y , y_t , but not the original amount of y .

$$y_t = \$10,000 \quad \bar{g} = .05 \quad t = 5$$

$$\$10,000 = y_0(1 + 1.05)^5$$

$$\$10,000 = y_0(1.05)^5$$

$$\$10,000 = y_0(1.27628)$$

$$\$10,000/1.27628 = y_0$$

$$\$7,835.26 = y_0$$

If we leave the money in the account for two more years:

$$y_0 = \$10,000 \quad \bar{g} = .05 \quad t = 2$$

$$y_t = \$10,000(1 + .05)^2$$

$$y_t = \$10,000(1.05)^2$$

$$y_t = \$10,000(1.1025)$$

$$y_t = \$11,025.00$$

If we start a college fund with \$10,000 to be used 18 years later at a 6% interest rate:

$$y_0 = \$10,000 \quad \bar{g} = .06 \quad t = 18$$

$$y_t = \$10,000(1 + .06)^{18}$$

$$y_t = \$10,000(1.06)^{18}$$

$$y_t = \$10,000(2.854339)$$

$$y_t = \$28,543.39$$

- 2) In this problem, we're trying to find the value of z , students going to graduate school in economics, based on the values and growth rates of x , students majoring in economics, and y , students minoring in economics.

a) $z = y$, so $g_z = g_y$

$$t = 3 \quad z_0 = 3,000 \quad z_x = .03$$

$$z_t = 3000 * (1 + .03)^3$$

$$z_t = 3000 * (1.03)^3$$

$$z_t = 3000 * 1.092727$$

$$z_t = 3278.181 = 3278 \text{ students}$$

b) $z=x$, so $g_z = g_x$
 $t=5$ $z_0=4,000$ $z_x=.04$

$$z_t=4000*(1+.04)^5$$
$$z_t=4000*(1.04)^5$$
$$z_t=4000* 1.216652902$$
$$z_t= 4866.61161=4866 \text{ students}$$

c) $z=x^{3/4} y^{1/4}$
 $t=2$, $z_0=7,000$

First we need to calculate g_z :

$$g_z = .75g_x + .25g_y$$
$$g_z = .75(.03) + .25(.04)$$
$$g_z = .0225 + .01$$
$$g_z = .0325$$

Now we can calculate z_t :

$$z_t=7000*(1+.0325)^2$$
$$z_t=7000*(1.0325)^2$$
$$z_t=7000* 1.06605625$$
$$z_t= 7462.39375=7462 \text{ students}$$