

**Quiz #0: Math Tools**

Revised: January 27, 2013

*Please write your name in the upper right corner. This quiz won't affect your grade, but it's a useful guide to me about your background and an accurate indication of the kinds of tools we'll be using. Please write your answers in the space provided. If you don't know an answer, perhaps you could suggest a way to get started.*

1. Consider the value of a consol, a bond that pays a coupon  $C$  at the end of every year, forever, beginning next year. If  $q = 1/(1 + r)$  is the discount factor (that's the term we'll use), what is the present discounted value

$$qC + q^2C + q^3C + \dots ?$$

What happens if  $C = r$ ?

2. Let consumption  $c$  be positive and utility have the form  $u(c) = c^{1-\alpha}/(1-\alpha)$  for some parameter  $\alpha > 0$ . What is the derivative of  $u$  with respect to  $c$ ? The second derivative? What are their signs?

3. Consider a random variable  $x$  that takes on the value one with probability  $p$  and zero with probability  $1 - p$ . What is the expected value or mean of  $x$ ? The variance? The standard deviation?

4. What do the functions below represent?

$$\begin{aligned}p(x) &= (2\pi\sigma^2)^{-1/2} \exp[-(x - \mu)^2/2\sigma^2] \\M(t) &= \exp[t\mu + t^2\sigma^2/2]\end{aligned}$$