

PRINT Your Name: \_\_\_\_\_

**Quiz 13 — April 13, 2012 – Section 8 – 10:10 – 11:00**

**Remove everything from your desk except a pencil or pen.**

**Write in complete sentences.**

The quiz is worth 5 points.

Find the sum of  $\sum_{n=2}^{\infty} n(n-1)x^n$  for  $|x| < 1$ .

**Answer.** We know that  $\sum_{n=0}^{\infty} x^n = \frac{1}{1-x}$  for  $|x| < 1$ . Take the derivative to get

$\sum_{n=0}^{\infty} nx^{n-1} = \frac{1}{(1-x)^2}$  for  $|x| < 1$ . Take another derivative to get:  $\sum_{n=0}^{\infty} n(n-1)x^{n-2} =$

$\frac{2}{(1-x)^3}$  for  $|x| < 1$ . Multiply by  $x^2$  to get:  $\sum_{n=0}^{\infty} n(n-1)x^n = \frac{2x^2}{(1-x)^3}$  for  $|x| < 1$ . Of

course, when  $n = 0$  or  $n = 1$ , then  $n(n-1)x^n$  is zero; so  $\sum_{n=2}^{\infty} n(n-1)x^n = \frac{2x^2}{(1-x)^3}$  for  $|x| < 1$ .