

**Instructions** Please write your name in the upper right-hand corner of the page. Write complete sentences to explain your solutions.

1. Recall from section 3.11 that  $P(x) = f(a) + f'(a)(x-a) + \frac{1}{2}f''(a)(x-a)^2$  is the quadratic approximation to the function  $f$  at the point  $a$ . Use l'Hospital's rule to show that if  $f$  has a continuous second derivative, then

$$\lim_{x \rightarrow a} \frac{f(x) - P(x)}{(x-a)^2} = 0.$$

2. The TI-89 calculator says that  $\tan^{-1}(\tan(\pi)) = 0$ . Since  $\tan^{-1}$  and  $\tan$  are inverse functions, why is the answer not equal to  $\pi$ ?

3. Show that  $\sin^2(\cos^{-1}(x)) = 1 - x^2$  when  $-1 \leq x \leq 1$ .  
[Remember that the two exponents have different meanings: the exponent  $-1$  means inverse function, while the exponent 2 means the second power.]

4. The TI-89 calculator says that  $\lim_{x \rightarrow \infty} (xe^{1/x} - x) = 1$ . Prove this result.