



Ma1023  
Quiz 5 A

# Calculus III

A Term, 2013

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

1. (2 pts) Let  $f(x)$  be a function and let  $P_5(x)$  be the 5'th Taylor polynomial centered at  $a$ .

Which of the following is true about approximation  $f(x) \approx P_5(x)$ .

- a)  $|P_5^{(10)}(x)| \leq |f^{(10)}(x)|$       b)  $P_5^{(2)}(x) = f^{(2)}(x)$   
c)  $P_5^{(10)}(a) = f^{(10)}(a)$       d) none of these  
[ $P_5^{(10)}(x) = 0$ .]

2. (2 pts) Which of the following functions has Taylor Series  $\sum_{k=0}^{\infty} \frac{(-1)^{k+1} x^k}{k!}$

- a)  $e^x$       b)  $e^{-x}$   
c)  $-e^{-x}$       d)  $|e^x|$

3. (4 pts) Find the second Taylor Polynomial  $P_2(x)$  for the function  $f(x) = \sqrt{x}$  centered at  $a = 10$ .

$$P_n(x) = f(a) + f'(a)(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \dots$$

$$f(x) = x^{1/2} \quad f(10) = \sqrt{10}$$

$$f'(x) = \frac{1}{2}x^{-1/2} \quad f'(10) = \frac{1}{2\sqrt{10}}$$

$$f''(x) = -\frac{1}{4}x^{-3/2} \quad f''(10) = \frac{-1}{4(10)^{3/2}}$$

$$P_2(x) = \sqrt{10} + \frac{(x-10)}{2\sqrt{10}} + \frac{(-1)(x-10)^2}{4(10)^{3/2}(2!)}$$

Thanks to Brandon Bozeat.

4. (2 pts) Give the remainder for the approximation in Problem 2 for  $\sqrt{110}$ .

$$f'''(x) = \frac{3}{8}x^{-5/2}$$

$$R = \frac{\frac{3}{8}2^{-5/2}(x-10)^3}{3!} = \frac{3 \cdot 100^3}{8 \cdot 8 \cdot 2 \cdot 2^{5/2}} = \frac{1000}{16 \cdot 2^{5/2}} = \frac{125}{2 \cdot 2^{5/2}}$$

for  $z$  between 10 and 110

Thanks to Marc Toomajian