

Math 201 Mock Quiz 9 Answers

Name: ANSWERS

Instructions: No calculators. Use provided scrap. Write your fully simplified answers in the space provided.

1. For a function  $f(x)$  write down the formula for its linearization at  $a$ .  $L(x) =$   $f(a) + f'(a)(x-a)$

2. Suppose  $y = f(x)$ , find the differential  $dy =$   $f'(x) dx$

3. A pebble is dropped into a calm pond, causing ripples in the form of concentric circles. The radius  $r$  of the outer ripple is increasing at a rate of  $\pi$  feet per second. At what rate is the total area  $A$  of disturbed water changing when  $r = 2$ ?

(a) The equation I used (before differentiating) is  $A = \pi r^2$

(b) After differentiating, I have  $\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$

(c) The rate of change of  $A$  is (state your answer as an equation involving a derivative):  $\frac{dA}{dt} = 4\pi^2$

4. Use linear approximation or differentials to approximate  $(8.1)^{2/3}$  by completing the following:

(a) Define a function to use:  $f(x) =$   $x^{2/3}$

OK to plug in  $x=8.1, a=8$

(b)  $x =$   $8.1$ ,  $a =$   $8$

(c) The general formula (in  $f$ ) used to make the approximation  $f(x) \approx f(a) + f'(a)(x-a)$

(d) The approximate value is  $\frac{121}{30} \approx 4.0333$

**Bonus (Complete the other problems to be eligible):**

1. For a function  $f(x)$ , define "critical number of  $f$ " This is an  $x$  such that  $f'(x) = 0$  or  $f'(x)$  is undefined.

2. Suppose a function is defined on a closed interval  $[a, b]$ , define the "absolute minimum of  $f$  on  $[a, b]$ "

$f(x_1)$  is an abs min if  $f(x_1) \leq f(x_2)$  for all  $x_1, x_2 \in [a, b]$ .