

## Math 220 Quiz 4

25 September 2015

Name: *Answer Key*

1. For which real numbers  $a$  is the following function continuous at  $a$ ? For which  $a$  is it not continuous at  $a$ ?

$$f(x) = \begin{cases} 2x + 4 & \text{when } x \geq 3 \\ x^2 + 1 & \text{when } 3 \geq x \geq -3 \\ (2x + 9)^2 & \text{when } -3 \geq x \end{cases}$$

$f(x)$  is continuous on the intervals  $(-\infty, -3)$ ,  $(-3, 3)$ , and  $(3, \infty)$  since it is a polynomial on each interval.

$f(x)$  is continuous at 3 since  $\lim_{x \rightarrow 3^+} f(x) = 10 = \lim_{x \rightarrow 3^-} f(x) = f(3)$

$f(x)$  is not continuous at -3 since  $\lim_{x \rightarrow -3^-} f(x) = 9 \neq 10 = \lim_{x \rightarrow -3^+} f(x)$

2. Find the derivative of  $f(x) = (x^2 + 1)^5(2x + 4)^7$ .

$$f'(x) = 5(x^2 + 1)^4(2x)(2x + 4)^7 + (x^2 + 1)^5 7(2x + 4)^6 \cdot 2$$

OR

if  $f(x) = (x^2 + 1)(2x + 4)$ , then  $f'(x) = (x^2 + 1)2 + 2x(2x + 4)$

3. Find the derivative of  $f(x) = \frac{2x + 4}{\sqrt{x^2 + 9}}$ .

$$f'(x) = \frac{\sqrt{x^2 + 9}(2) - (2x + 4) \frac{1}{2}(x^2 + 9)^{-\frac{1}{2}}(2x)}{x^2 + 9}$$

OR

if  $f(x) = \frac{2x + 4}{x^2 + 9}$ , then  $f'(x) = \frac{(x^2 + 9)2 - (2x + 4)(2x)}{(x^2 + 9)^2}$