

**Math 135, Sections 16-18 - Review problems for Exam #1 - February 16, 2010**

#1 Write an equation for a straight line:

- (a) which passes through the point  $(1, -2)$  and has slope 3;
- (b) which passes through the points  $(3, 5)$  and  $(5, -8)$
- (c) which passes through the point  $(-4, 1)$  and is parallel to the the straight line with equation  $y = -2x + 7$ ;
- (d) which passes through the midpoint of the line segment connecting the points  $(7, 4)$  and  $(2, 2)$  and is perpendicular to that line segment.

#2 Write an equation of the circle with center  $(3, 2)$  and radius 5.

#3 (a) The graph of the equation  $x^2 + y^2 - 2x + 4y - 4 = 0$  is a circle. What are the center and radius of this circle?

(b) The graph of the equation  $7x - 5y + 23 = 0$  is a straight line. What is its slope? If the point  $(a, 2a)$  is on this line, what is  $a$ ?

#4 Suppose that  $f(x) = 2x - 1$  if  $x < 1$ ,  $f(1) = a$  and  $f(x) = 3x + b$  if  $x > 1$ . Suppose further that  $f(x)$  is continuous at  $x = 1$ . What are  $a$  and  $b$ ?

#5 Find each of the following limits or state that the limit does not exist:

(a)  $\lim_{x \rightarrow 2} (x^2 + \frac{x}{x-1})$

(b)  $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x^2 - 4}$

(c)  $\lim_{x \rightarrow 2^+} \frac{x-2}{|x-2|}$

(d)  $\lim_{x \rightarrow 2^-} \frac{x-2}{|x-2|}$

(e)  $\lim_{x \rightarrow 2} \frac{x-2}{|x-2|}$

(f)  $\lim_{x \rightarrow 2^+} \frac{1}{|x-2|}$

(g)  $\lim_{x \rightarrow 4} \frac{x-4}{\sqrt{x}-2}$

#5 Use the definition of derivative to find

(a)  $f'(x)$  if  $f(x) = x^2 + x + 1$

(b)  $g'(x)$  if  $g(x) = \frac{2}{x+1}$

(c)  $h'(x)$  if  $h(x) = \sqrt{2x+3}$

#6 In each part, find  $f'(x)$  by any method:

(a)  $f(x) = x^3 + 2x^2 - x + 3$

(b)  $f(x) = x\sqrt{x} + 3\frac{1}{x\sqrt{x}}$

(c)  $f(x) = \sin(2x+3)$

(d)  $e^{(2x+3)}$

(e)  $f(x) = e^{\sin(x)}$

(f)  $f(x) = \frac{\sin(x)}{e^{2x+3}}$

(g)  $f(x) = \sqrt{\frac{x^2+1}{x^2+2}}$

(h)  $f(x) = (x^3 + 2x)^{17}$

#6 A straight east-west road goes through the town of Bend. Suppose that at time  $t$  (in hours), where  $0 \leq t \leq 10$ , a car is  $20 + 8t - t^2$  miles east of Bend.(a) What is the velocity of the car at time  $t$ ?(b) What is the speed of the car at time  $t$ ?(c) What is the acceleration of the car at time  $t$ ?(d) What is the total distance traveled by the car between  $t = 1$  and  $t = 7$ ?#7 Suppose  $f(x)$  and  $g(x)$  are two functions which are defined for all real numbers. Suppose that

$f(-2) = 1, f(-1) = 0, f(0) = 2, f(1) = 1, f(2) = -1,$

$g(-2) = -2, g(-1) = 1, g(0) = 0, g(1) = -2, g(2) = 2,$

$f'(-2) = 0, f'(-1) = 3, f'(0) = -3, f'(1) = 2, f'(2) = -1,$

$g'(-2) = 2, g'(-1) = -1, g'(0) = 2, g'(1) = -2, \text{ and } g'(2) = 3.$

Let  $h(x) = f(g(x))$  and  $p(x) = g(f(x))$ . Find:

(a)  $h(2)$

(b)  $h'(2)$

(c)  $p(2)$

(d)  $p'(2)$