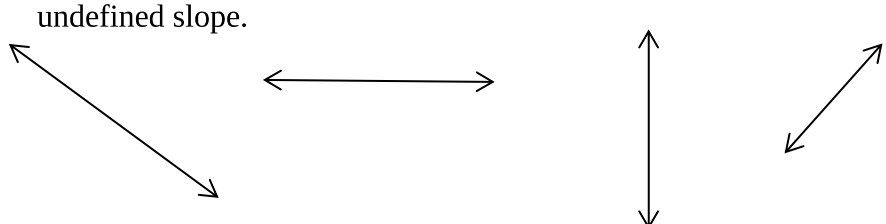
MA 15910 Review Worksheet for Exam 2, Spring 2016

1) (a) Find the slope of a line through each pair of points. (b) Find the equation of each line in standard form.

$A \quad (5,8)$ and $(-3,-1)$ $\qquad B \quad \left(\frac{3}{2},2\right)$ and $\left(-\frac{7}{2},-5\right)$

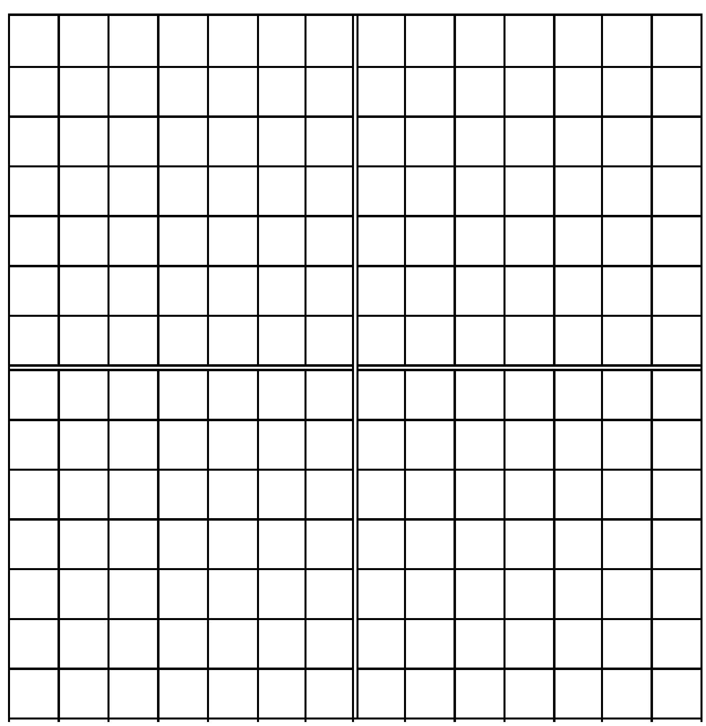
2) Find the equations of a vertical line and a horizontal line through the point (-5, 3).

3) Identify which line has (a) positive slope, (b) negative slope, (c) zero slope, and (d) undefined slope.



4) Sketch the graph of each line using the slope and a point.

$(a) \quad y=-\frac{3}{4}x+2 \qquad (b) \quad 3x-5y=-15$



5) Find the average rate of change for each function over the given interval.

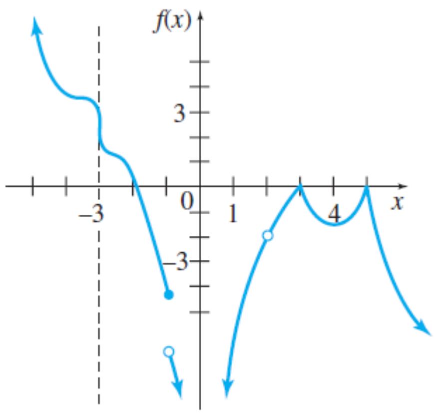
$a)\quad y=-4x^2-6 \quad [2,6]$ $\qquad b)\quad y=\sqrt{3x-2} \quad [1,6]$

6) Suppose the position of an object moving in a straight line is given by $s(t)=t^2+5t+2$. Find the instantaneous velocity when $t = 5$.

7) Suppose the total profit in hundreds of dollars from selling x items is given by $P(x)=2x^2-4x+5$. (a) Find the average rate of change of profit for the changes for 2 to 5 items. (b) Find the instantaneous rate of change of profit when $x = 2$.

8) Suppose the total profit in hundreds of dollars from selling x items is given by $P(x) = 2x^2 - 4x + 3$. Find the average rate of change in the profit as x changes from 2 to 4 and interpret.

9) For what x values would the function graphed below not have derivatives.



10) If \$2000 is invested in an account that pays 4% compounded annually, the total amount A in the account after t years is given by $A(t)=2000(1.04)^t$. Find the average rate of change per year of the total amount in the account for years $t = 3$ through $t = 7$.

11) Use the limit definition of a derivative to find the derivative for each function. Then use that derivative to find $f'(-2)$, $f'(0)$, and $f'(3)$.

$a)\quad f(x)=3x^2-2x$ $\qquad b)\quad f(x)=\dfrac{3}{x}$

12) For the function $f(x) = x^2 - 2x$, find (a) the equation of the secant line through the points where $x = 1$ and $x = 4$ and (b) the equation of the tangent lines when $x = 1$ and $x = 4$.

13) The revenue in dollars generated from the sale of *x* items is given by $R(x)=10x-\dfrac{x^2}{100}$.

(a) Find the marginal revenue when 500 items have been sold. (b) Estimate the revenue from the sale of the 601st item by finding $R'(600)$.

14) The cost in dollars of producing *x* tacos at a fast food restaurant is $C(x)=-0.00375x^2+1.5x+1000$, for [0,180]. (a) Find the marginal cost function. (b) Find and interpret the marginal cost at a production level of 100 tacos. (c) Find the exact cost to produce the 101st taco. (d) Compare the answers to parts b and c. How are they related?

Find the derivative of each. (15 – 20)

15) $y=3x^5-6x^3+\dfrac{1}{2}x^2-2x$

16) $f(x)=10x^{-4}-\dfrac{7}{x^3}+3x$

17) $g(x)=(2x^2-5)^2$

18) $y=(3x^2+1)(2x^2-4x+3)$

19) $q(x)=\dfrac{x^2+7x-2}{x^2-2}$

20) $r(x)=\sqrt{5x^3-4x^2}$

21) Find $f'(2)$ if $f(x)=x^4-\dfrac{4}{3}x^3+2x^2-5x+8$.

22) Find all points on the graph of $g(x)=x^3+9x^2+19x-10$ where the slope of the tangent line is -5.

23) Find an equation of the line tangent to the graph of $f(x)=\dfrac{x}{x-2}$ at the point (3,3).

24) Find all values of *x* where the tangent line to the graph of the function *g* is a horizontal line. $g(x)=x^3+3x^2$.

25) Assume that the total number (in millions) of bacteria present in a culture at *t* hours is given by $N(t)=4t^2(t-20)^2+20$. Find the rate at which the population of bacteria is changing at 5 hours and at 8 hours.

26) If $g'(5)=12$ and $h'(5)=-3$, find $f'(5)$ for $f(x)=3g(x)-2h(x)+3$.

27) If the price in dollars of a stereo system is given by $p(q)=\dfrac{1000}{q^2}+1000$, where q represent the demand (number) of the stereo systems, find the marginal revenue when the demand is 10. Interpret.

28) The body mass index (BMI) is a number that can be calculated for any individual as follows. $BMI=\dfrac{703w}{h^2}$, where w is weight in pounds and h is height in inches. (a) Calculate the BMI for a person with a weight of 250 pounds and a height of 74 inches. (b) For a 125-pound female, what is the rate of change of BMI with respect to height? (The function would be $f(h)=\dfrac{703(125)}{h^2}$.) (c) Calculate and interpret the meaning of $f'(65)$.

29) For the position function $s(t)=18t^2-13t+8$ (in feet and time in seconds), find the velocity function $v(t)$ and the velocities when $t=0,\ t=5, and\ t=10$.

30) Find the derivative of the function $h(x)=\dfrac{(3x+1)(2x-1)}{3x+4}$.

31) Given: $g(3)=4$, $g'(3)=5$, $f(3)=9$, and $f'(3)=8$, find $h'(3)$ when $h(x)=\dfrac{f(x)}{g(x)}$.

32) Find an equation of the line tangent to the graph of $f(x)=(2x-1)(x+4)$ at $(1,5)$.

33) Find the value(s) of x in which $f'(x)=0$, if $f(x)=\dfrac{x-3}{x^2+9}$.

34) Suppose the total number (in millions) of bacteria present in a culture at a certain time t (in hours) is given by $N(t)=2t(t-8)^2+20$. (a) Find $N'(t)$. (b) Find the rate at which the population of bacteria is changing at 10 hours. Interpret.

35) Some psychologists believe that the number of facts of a certain type that are remembered after t hours is given by the function $f(t)=\dfrac{90t}{99t-90}$. Find the rate at which the number of facts remembered is changing after (a) 1 hour and after (b) 10 hours.

36) Given: $f(x)=4x^2-3x$ and $g(x)=6x+2$. Find (a) $f[g(2)]$ and (b) $g[f(-4)]$.

37) If $y=(6x-2)^{3/2}$, write two functions f and g, such that $y=(f\circ g)(x)$

Find the derivatives.

38) $m(x) = 3x(2x^5 + 3)^4$

39) $f(x) = \dfrac{(2x-3)^4}{3x^2 + 2}$

40) Find the equation of the line tangent to $g(x) = \left(x^2 + 4\right)^{2/3}$ at $x = 2$.

41) Find all values of x such that the tangent line is horizontal.

$$f(x) = \frac{x}{(x^2 + 4)^4}$$