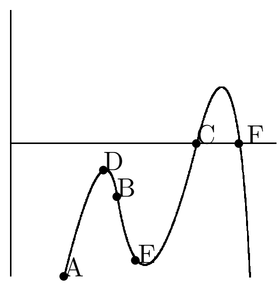
review #2
MATH 131

1. The distance in feet of an object that is thrown up in the air is given by $h(t) = 6 + 100t + 16t^2$.
   (a) What is the average velocity of the object between $t = 3$ and $t = 6$? Between $t = 1$ and $t = 2$?
   (b) What is the instantaneous velocity at $t = 4$?

2. Arrange the points on the graph from least slope to most slope.



3. At which of the points in the previous picture is the derivative greatest? least?

4. Find the value of the derivative of $f(x) = 3x^2 + e^{2x}$ at $x = 2$.

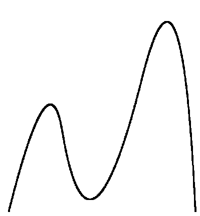
5. Graph $g(t) = -x^3 + e^x$. Are the values of the derviative positive, negative, or zero at -2, -1, 0, 1, 2, 3, 4, 5?

6. The ratios of two populations of ethnic groups in a large city is changing as given.

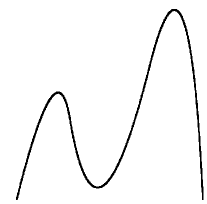
year	1	2	3	4	5
ratio	1.11	1.07	1.04	1.01	.988

   Estimate the derivative at each year.

7. Sketch the graph of the derivative of the function shown.



8. Sketch the graph of the 2nd derivative of the function shown.



9. Use the calculator to find the derivatives at 1,2,3,4,5 for $f(t) = 2^t$, $g(t) = 3^t$, $h(t) = 4^t$, attempt to find the equation of the derivative. (use one of the regression lines on your answer)

10. Graph the following functions and sketch the first and second derivatives from the graph. $f(t) = 2^t$, $g(t) = (t-1)(t-2)(t-3)$, $h(t) = -t^3 + e^t$.

11. The weight, W, in lbs., of a child is a function of its age, a, in years.
    (a) Is $w'(a)$ positive or negative? Why?
    (b) What does $W(8) = 55$ tell you? Give units.
    (c) What does $W'(8) = 4$ tell you about age and weight?
    (d) as a increases do you expect $W'(a)$ to increase or decrease? Why?

12. Sketch a smooth graph whose first derivative is negative and the second derivative is positve, then it changes to first derivative is positive and second derivative is negative.

13. Graph the function $f(x) = -x^5 + 2^x$ and describe the function in terms of where it is decreasing, increasing, concave up, concave down, positive and negative.

14. Describe the previous function in terms of first and second derivatives.

15. Sketch the graph of the function with the following information.
    horizontal-intercepts 0,4 and -4
    $f'(-2) = 0$, $f'(2) = 0$
    $f'(x) < 0$ on $(-2, 2)$.
    $f'(x) > 0$ on $(-\infty, -2)$ and $(2, \infty)$.
    $f''(x) < 0$ on $(-\infty, 0)$, $f''(x) > 0$ on $(0, \infty)$.

16. Let $g(x) = \sqrt{x}$ and $f(x) = kx^2$, where k is a constant.

    (a) Find the slope of the tangent line to the graph of g at the point $x = 4$.

    (b) Find the equation of this tangent line.

    (c) If $f(4) = 2$, find k.

    (d) Where does the tanget line intersect $f(x)$.

17. The velocity of a falling brick for the first 5 seconds is recorded.

time (sec)	1	2	3	4	5
velocity (ft/sec)	8	11	13	16	18

    (a) Find estimates for the distance traveled using upper and lower sums.

    (b) Find an equation for the data and get a better answer.

18. Estimate the following integrals using left and right rectangles with n=2, 4, and 8.

    (a) $\int_{x=0}^{4} e^x dx$

    (b) $\int_{x=3}^{1} x^2 dx$

    (c) $\int_{x=1}^{3} -x^2 dx$

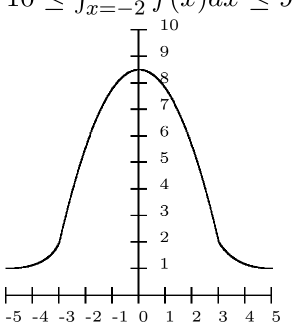
19. Find the areas between the following function on the given intervals.

    (a) $f(x) = x^2 + 2$, $g(x) = 1$, $x = 1$, $x = 3$

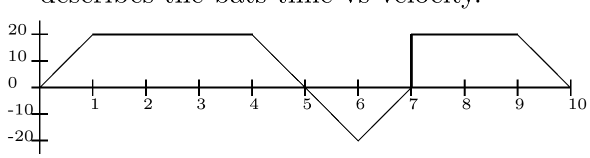
    (b) $f(x) = \sin(x)$, $g(x) = \frac{1}{2}$, $x = 0$, $x = 2\pi$

    (c) $f(x) = \sin(x)$, $g(x) = \cos(2x)$, $x = 1$, $x = 4$

20. From the graph of $f(x)$ show that $10 \le \int_{x=-2}^{2} f(x)dx \le 90$



21. A bat starts out traveling towards the exit of a tunnel 90 feet away. The graph below describes the bats time vs velocity.



    (a) How far does the bat travel in the 10 seconds?

    (b) How far from the starting point is the bat after 6 seconds?

    (c) Does the bat make it out of the tunnel in the 10 seconds?

    (d) How far out of the tunnel does the bat travel in the 10 seconds?

22. Water is leaking from a 5-gallon boiler at a rate of $R(t) = 2 * (.6299)^t$ gallons/minute.

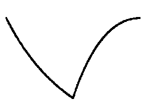
    (a) Write a definate integral that expresses the amount of water leaked out in the first t minutes.

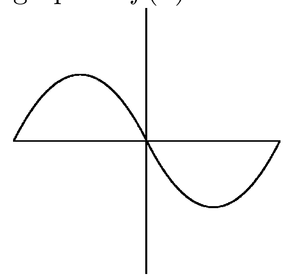
    (b) How much water has leaked out in the first minute?

    (c) If the boiler explodes when down to 1 gallon, how long til it explodes?

review #2

MATH 131

1. (a) $\frac{1182-450}{6-3}$, $\frac{270-122}{2-1}$
   (b) $h'(4) = 228$
2. F,B,E,D,C,A maybe A,C tough to tell with those two.
3. greatest C or A, least F
4. 121.196
5. -,-,+,-,-,-,+,+
6. -.0407,-.0355,-.0304,-.0253,-.0201
7. not easy to do on the computer
8. not easy to do on the computer
9. $f'(t) = \ln(2)2^t$,$g'(t) = \ln(3)3^t$,$f'(t) = \ln(4)4^t$
10. similar problem as 7 and 8
11. (a) positive, for normal children the weight goes up as the child gets older.
    (b) when the child is 8 years old, the child weighs 55 lbs.
    (c) when the child is 8 years old, the child is gaining 4 lbs/year.
    (d) decrease, because you expect the weight gain to slow down.
12. 
13. increasing -.55 to .68 and after 20.19; decreaseing before -.55 and between .68 and 20.19; concave up before .309 and after 17.89; concave down between .309 and 17.89; positive before 1.78 and after 22.44; negative between 1.78 and 22.44
14. first derivative positive where the function is increasing, first derivative is negative where the function is decreasing. similarly for the second derivative.
15. graph of $f(x)$



16. (a) slope=$\frac{1}{4}$
    (b) y-2 = $\frac{1}{4}$(x-4)
    (c) k=$\frac{1}{8}$
    (d) x=-2 and x=4
17. (a) upper sum = 11+13+16+18 lower sum 8+11+13+16
    (b) 53.42 using a quartic
18. draw the rectangles and find the areas
19. (a) 10.666...
    (b) .6848
    (c) 3.43
20. draw the rectangles appropriately
21. (a) 150 ft
    (b) 70 ft
    (c) yes
    (d) 20 ft
22. (a) $\int_0^t 2(.6299)^t \, dt$
    (b) 1.60 gallons
    (c) 5.59 minutes