1. The following table gives values for 3 different functions. Find a formula for the linear one. (#188 p.36)

t	f(t)	g(t)	h(t)
-1	15	21.6	1000
0	9	24.1	600
1	5	26.6	360
2	4	29.1	216

2. The following table gives values for 3 different functions. Find a formula for the exponential one. (#189 p. 36)

t	f(t)	g(t)	h(t)
-1	15	21.2	1000
0	9	24.1	600
1	5	27.0	360
2	4	29.9	216

3. Given the following data about the function, approximate f′(4) using, (#107p.87)

a) A right hand approximation only

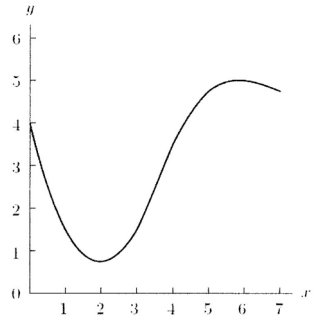
b) Using an average of right and left hand approximations.

x	3	3.5	4	4.5	5	5.5	6
f(x)	10	8	7	4	2	0	-1

4. For the following diagram answer the questions that follow: (#103&104p. 86&87)

a) Which is larger f′(5) or f′(4)? Support your answer.

b) Which is larger f″(1) or f″(4)? Support your answer.



5. Find the equation of the line tangent to $m(t) = 5e^{-2t}$ at t = 2, using exact values. (#180 p. 117)

6. Find the derivatives of each of the following:
(#129,140, 142,152,160,164&168 p. 111 -115)

a) $y = \sqrt{x^2 + 3}$ b) $y = x(x + a)^7$ c) $t = x \ln x$

d) $w = \dfrac{x - 2}{x^2 + 8}$ e) $y = e^{(e^x + 4)}$

f) $f(x) = 4x^3 - 5x^2 + 4x + 10$ g) $f(x) = \dfrac{3}{x} + \sqrt{9x + 1}$

7. The vertex form of a parabola is given by $f(x) = a(x - h)^2 + k$ for constants a, h, and k. Answer the following questions based on this equation.
(#174 & 175 p. 114)

a) At what value of x does f'(x) change sign (from positive to negative or vice versa)?

b) For what values of a is the parabola concave up?

8. A water park finds that at an admission price of $17, attendance is 450 per day. For every $1 decrease in price, 30 more people visit the park per day. What is the park attendance when admission prices are set to maximize revenue (to the nearest person)? Hint: This is similar to the bonus question from Ch. 4 test. Use derivatives not guess and check. (#96 p. 147)

9. Given the following table of production quantities with their corresponding marginal revenue and cost, estimate the production level that maximizes profit.
(#35 p. 134)

q	0	10	20	30	40	50
MR	100	100	100	100	100	100
MC	40	75	100	120	150	190

10. For the function $f(x) = -2x^3 + 3x^2 + 12x$ find all the following and graph the function labeling all points found with appropriate ordered pairs.

a) Find all critical points using Calculus. Give the ordered pair.

b) Indicate which critical points are maximum/minima based on the second derivative test.

c) Find all potential points of inflection and give as ordered pairs.

d) Use the first derivative to prove that the points in c) are inflection points.

e) Find the y-intercept and give it as an ordered pair.

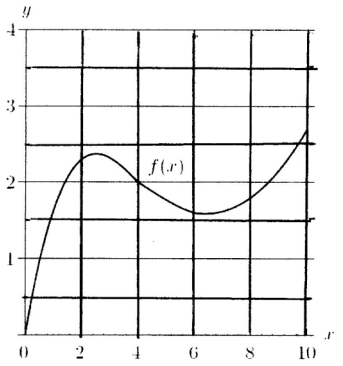
f) Use the quadratic formula to approximate the remaining 2 x-intercepts (note y-intercept).

g) Graph the function.

11. Use the information in the table gives the rate of r(t), in cubic centimeters, that air is leaking from a balloon t seconds after it is inflated.
Use the technique of left and right hand Riemann sums to estimate: $\int_0^{15} r(t)\,dt$
(#77 p. 175)

t	0	5	10	15	20
r(t)	14	11	9	8	7

12. Use the following figure to estimate $\int_0^8 f(x)\,dx$ (#78 p.175)



using a) the method of boxes
b) the geometric shape(s)
c) average height

13. An air conditioning unit is switched on in an 80° F room. The room is cooling at a rate of $r(t) = 2(0.8)^t$ °F per minute, with t in minutes after the unit was turned on. Set up an appropriate integral and evaluate it with a calculator to find the temperature, to the nearest degree, after 10 minutes. (#91 p. 182)

14. Find the present value of an income stream of $600 a year for 20 years at an interest rate of 5% compounded continuously. Round to the nearest dollar. (#81 p. 213)

15. Suppose you want to have $20,000 in 5 years time in a bank account earning 3% interest compounded continuously. If you make one lump sum deposit now, how much should you deposit? (#82 p. 213)

16. For the supply and demand curves given below, find the equilibrium price and quantity and compute consumer surplus to the nearest cent. Graph the curves and mark up the graph with equilibrium price p', p_0 and area representing consumer and producer surplus.
(#34 p. 200)

$D(q) = 80 - 7.15q$ $S(q) = 0.2q^2 + 10$

17. Your projected income from music recording royalties next year can be modeled

by $R(t) = 40t^4 - 1000t^3 + 8700t^2 - 30300t + 73400$ dollars, where t is the number of months since the start of the year. Use a calculator to find your projected monthly income from royalties over the first 6 months of the year. (#22 p.195)

18. Find the indefinite integral of each of the following. (#90, 92, 107, 88, 41, 44)

a) $f(x) = x^2 + 5$

b) $f(x) = \dfrac{5e^x}{5 + e^x}$

c) $f(x) = x^2(2x - 1)$

d) $f(x) = \ln x$

e) $f(x) = \dfrac{2x}{\sqrt{4 - x^2}}$

f) $f(x) = ze^{3z^2 + 4}$

19. Find an antiderivative F(x) with $F'(x) = x^2 - \dfrac{4}{x} + \dfrac{8}{x^3}$
(#25 p. 221)

20. Find the antiderivative of G(z) with $G'(z) = g(z)$ and $G(0)=4$, given that $g(z) = z - \sqrt{z}$
(#3 p. 219)

21. Use the Fundamental Theorem of Calculus to determine the value of b if the area under the graph is $f(x) = 3x^2$ between $x = 0$ and $x = b$ is 8. Assume $b > 0$.
(#54 p. 225)

22. Evaluate: (#58 p. 226)

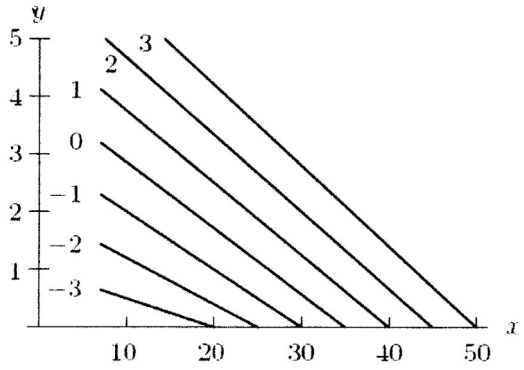
$$\int_4^5 (t-4)^5 \, dt$$

23. An object is launched upward. Its velocity (in ft per sec) after t seconds is given by $v(t) = -32t + 96$. If the objects initial height is 20 feet, find a formula for h(t), it's height after t seconds. Find the maximum height the object reaches and the time it takes to reach this height. (#104 p. 235)

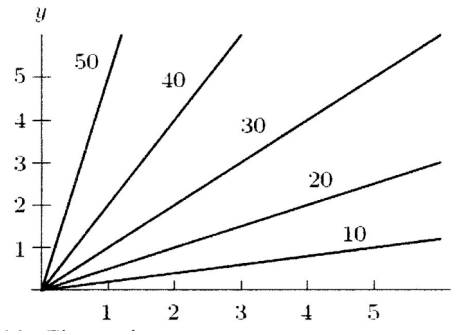
24. A company sells two products. The fixed costs for the company are $3200, the variable cost for product one is $8 per unit and the variable cost for the second product is $11 per unit. If the company produces q_1 units of product one and q_2 units of product two:
(#8 p. 273)

a) Give the total Cost as a function of q_1 and q_2.
b) Create a table for values 0, 10, 20, 30, 40 for each product
c) What is the total cost of 20 units of product one and 10 units of product two?
c) Create a graph

25. The following figure shows contours for the function z = f(x, y). Is z an increasing or decreasing function of y? (#19 p. 276)



26. The following is a contour diagram for the demand for pork as a function of the price of pork and the price of beef. Which axis corresponds to the price of pork? (#20 p. 277)



27. Use the table of values for f(x, y) to estimate f_y (4, 10). Use the next higher point to make your estimate. Is f_y positive or negative? (#37&38 p. 286)

		x = 0	2	4	6	8	10
y	**0**	500	510	525	560	590	640
	5	440	450	470	500	540	610
	10	410	420	445	480	520	575
	15	390	405	430	460	490	525
	20	375	385	410	435	475	500

28. An airline's revenue, R = f(x, y) is a function of the number of full price, x, and discount tickets, y, sold. When 300 full price and 600 discount tickets are sold R = \$225,000. Use $f_x(300, 600) = 350$ & $f_y(300, 600) = 200$ to estimate the revenue when x = 302 & y = 605. (#41 p. 286)

29. Find both partial derivative of the following functions and give them using correct notation. (#49 & 51 p. 288)

a) $f(x, y) = x^4 y^3$ b) $f(x, y) = x^2 + 5xy + y^2$

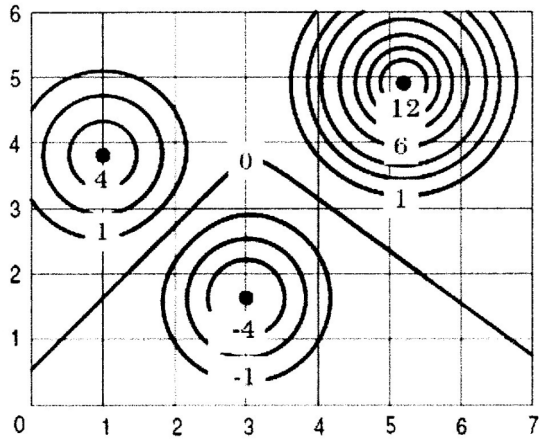
30. Now give all the second order partial derivatives using correct $\partial^2 z$ notation.

a) $f(x, y) = x^4 y^3$ b) $f(x, y) = x^2 + 5xy + y^2$

31. For $f(x, y) = x^2 e^{xy}$ find $f_x(1, 3)$
(#53 p. 289)

32. The volume of a cylinder is given by $V = f(r, h) = \pi r^2 h$, where the radius of the base and h is the height , both in centimeters. At a radius of 5 centimeters and a height of 8 centimeters, how much does the volume increase for each 1 cm increase in the height? (#60 p. 290)

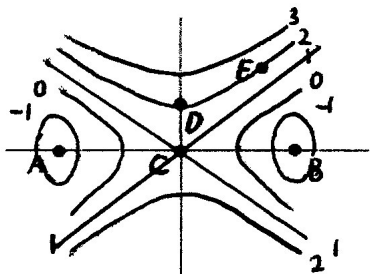
33. Give all the local and global maximum and minimum values and their x and y values (give as f(x, y)), based on the contour diagram. (#69 p. 292)



34. The function $f(x, y) = x^2 + 3xy - 15y$ has a local _____ (max/min/neither) at the critical point, where x = _____ and y = _____.
(#72 p. 293)

35. Two products are manufactured in quantities q_1 and q_2 and sold at prices \$8 and \$12 respectively. The cost of producing them is given by $C = q_1^2 + 2q_2^2 + 8$. Find the maximum profit that can be made. (#75 p. 293)

36. List all points in the contour diagram that represent critical points. (#86 p. 295)



37. Find the maximum value of $f(x, y) = 8xy$ subject to the constraint equation $2x + y = 16$ using Lagrange multipliers. (#106 p. 299) This probably won't get covered.