You must show work for all problems.

1. Solve the following equations for x.

(a). $45250 = 50(1.03)^{4x}$ $\frac{\ln(905)}{4\ln(1.03)} \approx 57.580$

(b). $250 = 300 - 300e^{-0.02x}$ $\frac{\ln(1/6)}{-.02} = \frac{\ln 6}{.02} \approx 89.588$

(c). $\log_3(2x+4) = -1$ $-\frac{11}{6}$

(d). $\ln x - \ln 4 = 3$ $4e^3$

2. The demand function for a product is given by $p = 2000e^{-q/4}$.

(a). At what price per unit will the quantity demanded equal 10 units? $164.17

(b). If the price is 89.50 per unit, how many units will be demanded, to the nearest unit. 12

3. $2400 is invested for 18 months at an annual *simple* interest rate of 4%.

(a). How much interest will be earned? $144 **(b).** What is the future value after 18 months? $2544

4. If you want to earn 5% annual simple interest on an investment, how much should you pay for a note that will be worth $12,000 in 10 months? $11,520

5.

(a). Find the 72nd term of the arithmetic sequence with first term 4 and common difference $-\frac{1}{4}$. $a_{72} = -13.75$

(b). Find the common difference of an arithmetic sequence with first term 3 and tenth term 39. $d = 4$

(c). Find the sum of the first 90 terms of an arithmetic sequence with the first term 7 and common difference 2. $s_{90} = 8640$

6. What is the future value and interest earned if $5500 is invested for 3 years at 6%

(a). Compounded quarterly? $S = \$6575.90, I = \$1075.90$ **(b).** Compounded continuously? $\$S = \$6584.70, I = \$1084.70$

7. What lump sum do parents need to deposit in an account earning 9% compounded monthly so that it will grow to $140,000 for their daughter's college tuition in 18 years. $27873.80

8. How long does it take for an account containing $2000 to be worth $5000 if the money is invested at 4% compounded quarterly. ≈ 23 years.

9. Find the annual percentage yield for an investment at

(a). 7.5% compounded semi-annually. 7.64% **(b).** 6.8% compounded continuously. 7.04%

10. Find the future value of an ordinary annuity of $3000 paid at the end of each quarter for 10 years, if it earns 5% compounded quarterly. $\$154,468.67$

11. You want to save $30,000 in 3 years for a down payment on a house. If you make monthly deposits into an account paying 9% compounded monthly, what is the size of the payments that is required to meet this goal. $728.99

12. Find the present value of an ordinary annuity of $1500 paid at the end of each 6-month period for 12 year if the interest rate is 8%, compounded semiannually. $\$22,870.44$

13. How much is needed in an account that earns 7.2% compounded monthly in order to withdraw $1200 at the end of each month for 20 years? $\$152,410.12$

14. A recent graduate's student loans total \$48,000. If these loans are at 2.8% compounded quarterly, for 10 years, what are the quarterly payments. \$1380.00

15. Suppose a loan of \$35,000 with interest at 8%, compounded semiannually, is to be repaid in 2 years by making 4 semiannual payments of equal size.

(a). Develop an amortization schedule for the loan.

Period	Payment	Interest	Balance Reduction	Unpaid Balance
				35000.00
1	9642.15	1400.00	8242.15	26757.85
2	9642.15	1070.31	8571.84	18186.01
3	9642.15	727.44	8914.71	9271.30
4	9642.15	370.85	9271.30	0.00

(b). Find the total interest paid. \$3568.61

16. Section 9.1 #5, 9, & 61

17. Find the following limits, if they exist. [You must show work.]

(a). $\lim_{x\to 2}(3x^2 - x + 1) = 11$ **(b).** $\lim_{x\to 3}\frac{x^2-9}{x^2-x-6} = \frac{6}{5}$ **(c).** $\lim_{h\to 0}\frac{3(x+h)^2-3x^2}{h} = 6x$

18. Find the average rate of change of $f(x) = 2x^2 - 3x$ over the interval $[2, 2.5]$. 6

19. Given $f(x) = x^2 - 4x$

(a). **<u>Use the limit definition</u>** $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$, to show that the derivative $f'(x)$ is $2x - 4$.

(b). Find the instantaneous rate of change of f at $x = -3$. -10 **(b).** Find the slope of the tangent line at $x = -3$. -10

For the remainder of the review sheet, use the DERIVATIVE FORMULAS, not the limit definition!

20. Find the derivative of given functions.

(a). $f(x) = 3x^4 - 4x^2 + 25x - 3$ $f'(x) = 12x^3 - 8x + 25$ **(b).** $s(t) = \frac{3}{t^4} - \frac{5}{t^2} + 6\sqrt{t}$ $s'(t) = -\frac{12}{t^5} + \frac{10}{t^3} + \frac{3}{\sqrt{t}}$

21. Find the equation of the tangent line to $y = 2x^3 - 3x + 1$ at $x = -1$. $y - 2 = 3(x+1) \Rightarrow y = 3x + 5$

22. Find the point(s) where the graph of $f(x) = x^4 - \frac{8}{3}x^3 + 10$ has horizontal tangent line(s). $(0, 10), (2, 14/3)$

23. If the cost for a commodity is $C(x) = 200 + 5x + .04x^2$ dollars, find and interpret the marginal cost at $x = 10$ units.
$C'(10) = 5.80$. The cost of producing 1 more unit will be approximately \$5.80.

24. Suppose that the demand for a product depends on price p according to $q = \frac{30000}{p^2} - \frac{3}{4}$, $p > 0$, where p is in dollars. Find and explain the meaning of the instantaneous rate of change of demand with respect to price when $p = 30$.
$\left.\frac{dq}{dp}\right|_{p=30} = -2.22$. If the price changes to \$31, the quantity demanded will go down by approximately 2.22 units.