

**MATH 1030-006**  
**Second Midterm**

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page. **Show all your work.**

Name: \_\_\_\_\_ ID: U \_\_\_\_\_

Question:	1	2	3	4	5	6	7	8	Total
Points:	10	10	18	15	10	10	12	15	100
Score:									

**The formulas below are provided for your convenience**

Savings Plan:  $A = \text{PMT} \times \frac{\left[ \left( 1 + \frac{\text{APR}}{n} \right)^{(nY)} - 1 \right]}{\left( \frac{\text{APR}}{n} \right)}$

Loan Payment:  $\text{PMT} = \frac{P \times \left( \frac{\text{APR}}{n} \right)}{\left[ 1 - \left( 1 + \frac{\text{APR}}{n} \right)^{(-nY)} \right]}$

Logarithm:  $\log_{10} a^x = x \times \log_{10} a$

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1. (a) (2 points) You deposit \$100 in an account with an APR of 8% and continuous compounding. How much will you have after 10 years?

- (b) (8 points) You deposit \$1000 in an account that pays an APR of 7% compounded annually. How long will it take for your balance to reach \$100,000?



(c) (10 points) If you decide instead to get a 20-year loan at the same rate for the same amount, what would your monthly payment be and how much would you save (in dollars) in interest (if you decided to take a 20 year loan instead of 30 year loan)?

4. You can afford monthly payment of \$500. If current mortgage rates are 9% for 30-year fixed rate loan,  
(a) (10 points) What loan principal can you afford?

(b) (5 points) If you are required to make a 20% down payment and you have the cash on hand to do it, how expensive a home can you afford?

5. Suppose your pet dog weighed 2.5 pounds at birth and weighed 15 pounds after one year.
- (a) (2 points) Identify the Independent and Dependent variable.
  
  
  
  
  
  
  
  
  
  
  - (b) (5 points) Find a linear model which describes this situation.
  
  
  
  
  
  
  
  
  
  
  - (c) (3 points) Use your model to predict your dog's weight at 5 and 10 years of age.
6. You can purchase a motorcycle for \$6500 or lease it for a down payment of \$200 and \$150 per month.
- (a) (1 point) Which model is this problem related to, linear or exponential?
  
  
  
  
  
  
  
  
  
  
  - (b) (5 points) Find a function that describes how the cost of the lease depends on time.
  
  
  
  
  
  
  
  
  
  
  - (c) (4 points) Use your function to find how long can you lease the motorcycle before you've paid more than its purchase price.

7. A certain medication breaks down in the human body (decreases) at a rate of 12% per hour.

(a) (3 points) Find the approximate half-life.

(b) (3 points) Find the exact half-life of that medication in your bloodstream.

(c) (6 points) If you took 500 mg of this medication at 2 pm, how much is left in your bloodstream at 9 pm?

8. (15 points) A toxic radioactive substance with a density of 3 milligrams per square centimeter is detected in the ventilating ducts of a nuclear processing building that was used 55 years ago. If the half-life of the substance is 20 years, what was the density of the substance when it was deposited 55 years ago?