

Place your name on the back of this sheet of paper and nowhere else. Staple your answers face up on the front of this sheet of paper. Failure to follow these directions will cost you 1 point. If you use double-sided printing or print on the back of scrap paper, I will give you one additional point.

1) (5 points each) Find the limits of the following sequences assuming  $a_n$  is what is in the parentheses.

A)  $\lim_{n \rightarrow \infty} \left( \frac{3n^2 + 7}{4n^3 + 5} \right)$

B)  $\lim_{n \rightarrow \infty} \left( \frac{3n^2 + 7}{4n + 5} \right)$

C)  $\lim_{n \rightarrow \infty} \left( \frac{3n^2 + 7}{4n^2 + 5} \right)$

2) (20 points) Suppose that you get \$8100 this year and every year after that you get  $2/3$  of what you got the year before. Set up the sequence of payments showing the first 4 payments ( $a_n$ ). What are the first 4 entries in the series  $s_n$ ? Does the series converge? If yes, prove it and find the limit. If not, prove it does not. (Do not worry about present value.)

3A) (15 points) Publishers' Clearinghouse has a contest which will give the winner "a million dollars per year forever." Suppose the interest rate is 10%. Set up the present value calculations briefly explaining how you set them up. Then find the present value of winning the contest.

B) (15 points) In reality, they only pay for the rest of your life and then the rest of the life of the person you choose to succeed you. Suppose the two of you combined live another 100 years. Find the value of winning.

C) (5 points) Why isn't there a big difference between your two answers?

4) (20 points) Suppose that a building costs \$200,000 to build. You will earn \$20,000 a year for 10 years and then you can sell it for \$100,000. Set up the calculation which will determine the internal rate of return. Briefly explain how you got it.

5) (10 points) Determine if the following function is continuous. If it is discontinuous, tell me where it is discontinuous and how you know it is discontinuous there.

$$F(X) = \begin{cases} X + 2 & X < 0 \\ X^2 + 2 & 0 \leq X < 5 \\ 5X + 3 & 5 \leq X < 10 \\ X^2 - 5X + 3 & X > 10 \end{cases}$$