Math 252: Quiz 5 **15 October, 2026**

Name: _____ **/ 25**

30 minutes maximum. No aids (book, calculator, etc.) are permitted. Show all work and use proper notation for full credit. Answers should be in reasonably-simplified form. 25 points possible.

1. Consider the sequence defined by $a_1 = 2$ and $a_n = -\frac{1}{2}a_{n-1}$.

   (a) (2 points) Write out the first 5 terms of the sequence. Simplify each term.

   $a_1 =$ _____ $a_2 =$ _____ $a_3 =$ _____ $a_4 =$ _____ $a_5 =$ _____

   (b) (4 points) Find a formula (closed form) for the nth term a_n of the sequence.

   (c) (3 points) Is the sequence bounded? Justify your answer. If it is bounded, clearly state the bounds.

   (d) (3 points) Is the sequence monotone? Justify your answer.

   (e) (3 points) What (if anything) can you say about the sequence based on your answers to parts (c) and (d)?

2. Compute the following integrals or show that they diverge. Show all work and use proper notation.

   (a) (5 points) $\displaystyle\int_1^\infty \frac{\ln(x)}{x}\,dx$

   (b) (5 points) $\displaystyle\int_0^9 \frac{dx}{\sqrt{x}}$

   (c) BONUS (2 points) Compute the following integral. $\displaystyle\int_0^3 \frac{1}{x-1}\,dx$