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

1. [10 points] Determine if the improper integrals converge or diverge. If the integral converges, determine the value of the integral. Full points will be awarded only if the solution is written using proper notation.

a. $\int_0^{\infty} \frac{2}{25+x^2} dx$

b. $\int_2^6 \frac{1}{\sqrt{6-x}} dx$

c. $\int_0^{10} \frac{1}{x^{\pi}} dx$

2. [5 points] Find the area of the region in the first quadrant between the curve $y = e^{-4x}$ and the x -axis.

3. [10 points] For each sequence, (i) find the first four terms (no simplification required) and (ii) determine whether the sequence converges or diverges. If it converges, find its limit.

a. $a_n = \frac{\ln(n^3)}{\ln(5n)}$

b. $a_n = \frac{100}{n!}$

c. $a_1 = 4, a_{n+1} = \frac{1}{3}a_n$