Homework 8 - Math 142 **Name:** _____

1. Find $\int_0^\infty x^2 e^{-2x}\,dx$.

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2. Show that each of the following integrals diverge by finding a smaller (simpler) integral that diverges.

   (a) $\int_0^1 \frac{e^x}{x^2}\,dx$

   (b) $\int_e^\infty \sqrt{\ln x}\,dx$

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3. For each of the following, find a larger integral that converges.

   (a) $\int_0^\infty e^{-x}\sin^2 x\,dx$

   (b) $\int_1^\infty \frac{\sqrt{x}}{1+x^2}\,dx$

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4. Determine whether the integral $\int_2^\infty \sqrt{\frac{\sqrt{x}+3}{x-1}}\,dx$ converges or diverges by finding a simpler integral to compare it with. Clearly explain how your comparison works.
