1. [12 points] Determine if the following integrals converge or diverge. If the integral converges, circle the word "converges" and give the **exact value** (i.e. no decimal approximations). If the integral diverges, circle "diverges". In either case, **you must show all your work and indicate any theorems you use**. Any direct evaluation of integrals must be done **without using a calculator**.

a. [6 points] $\displaystyle\int_0^1 \frac{e^x \sin(2x) - (2e^x - 2)\cos(2x)}{\sin^2(2x)}\,dx$

$\left(\text{Note: } \dfrac{d}{dx}\left(\dfrac{e^x - 1}{\sin(2x)}\right) = \dfrac{e^x \sin(2x) - (2e^x - 2)\cos(2x)}{\sin^2(2x)}\right)$

Converges **Diverges**

b. [6 points] $\displaystyle\int_2^\infty \frac{1}{(\ln x)^2 x}\,dx$

Converges **Diverges**