Math 31, Spring 2011
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WU # 2

Name: _____

Calculate the following area:

$$\int_{-1}^{1} \frac{1}{x^4} dx$$

Solution:
The trouble spot is at $x = 0$, so we write:

$$\int_{-1}^{1} \frac{1}{x^4} dx = \int_{-1}^{0} \frac{1}{x^4} dx + \int_{0}^{1} \frac{1}{x^4} dx$$

However, both integrals diverge. For example,

$$\begin{aligned} \int_{0}^{1} \frac{1}{x^4} dx &= \lim_{a \to 0^+} \int_{a}^{1} \frac{1}{x^4} dx \\ &= \lim_{a \to 0^+} -\frac{x^{-3}}{3} \Big|_{a}^{1} \\ &= \lim_{a \to 0^+} \left(\frac{1}{3a^3} - \frac{1}{3} \right) \end{aligned}$$