Calculus Study Guide: 7.7

Determine whether the integral converges or not, and say how you know.

$$\int_0^1 \frac{dx}{x^{\frac{999}{1000}}}$$

converges diverges I can't tell

Why do you draw this conclusion? $\frac{1}{x^p}$ rule

$$\int_1^\infty \frac{dx}{\sqrt[3]{x} + x^3}$$

converges diverges I can't tell

Why do you draw this conclusion? $\frac{1}{x^p}$ rule, comparison test

$$\int_1^\infty \frac{dx}{x^{1.1} - 1}$$

converges diverges I can't tell

Why do you draw this conclusion? $\frac{1}{x^p}$ rule, comparison test inconclusive

$$\int_1^\infty \frac{dx}{x^{1.1} + 1}$$

converges diverges I can't tell

Why do you draw this conclusion? $\frac{1}{x^p}$ rule, comparison test

$\int_3^4 \frac{dx}{(x-3)^2}$ $u = x-3$ $du = dx$ $\int u^{-2}\,du = -u^{-1} = -\frac{1}{u}$

$-\frac{1}{x-3}\Big|_3^4 = -\frac{1}{1} - -\frac{1}{0} \to \infty$ or DNE

OR: $\int_0^1 \frac{1}{u^2}\,du$ diverges by $\frac{1}{x^p}$ rule

converges (diverges) I can't tell

Why do you draw this conclusion? calculating the integral or $\frac{1}{x^p}$ rule

$\int_1^\infty xe^{-x}\,dx$ Integration by Parts. LIPET. $u = x$ $dv = e^{-x}$

$du = dx$ $v = -e^{-x}$

$= -xe^{-x} - \int -e^{-x}\,dx = -xe^{-x} - e^{-x}$

$\lim_{R\to\infty} \frac{-x}{e^x} - \frac{1}{e^x}\Big|_1^R = \frac{-R}{e^R} - \frac{1}{e^R} - \left(-\frac{1}{e} - \frac{1}{e}\right)$

$\frac{-R}{e^R} \to 0$ $\frac{1}{e^R} \to 0$ $= \frac{2}{e}$

(converges) diverges I can't tell

Why do you draw this conclusion? calculating the integral