$\frac{20}{20}$

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CAL 2 HW3

Pg 355

10) $\int_1^\infty \frac{x}{4+x^2}\,dx = \lim_{a\to\infty} \int_1^a \frac{1}{x^2+4} x\,dx = \lim_{a\to\infty} \int_1^a \frac{1}{u}\left(\frac{1}{2}\right) du$

$u = x^2+4$

$\to \lim_{a\to\infty} \frac{1}{2}\int_1^a \frac{1}{u}\,du = \frac{1}{2}\ln u \quad \frac{du}{2} = \frac{2x\,dx}{2}$

$\frac{1}{2}du = x\,dx$

$\to \lim_{a\to\infty} \frac{1}{2}\ln|x^2+4| \Big|_1^a + C$

5 $\to \left(\frac{1}{2}\ln|a^2+4|\right) - \left(\frac{1}{2}\ln|1^2+4|\right) = \frac{1}{2}\ln|a^2+4| - .80472$

$= \infty - .80472 = \boxed{\text{IT DIVERGES } \infty}$

26) $\int_3^\infty \frac{dx}{x(\ln x)^2} = \int_3^\infty \frac{1}{x}\left(\ln(x)\right)^{-2} dx = \lim_{a\to\infty}\int_3^a u^{-2}\,du = \lim_{a\to\infty} \frac{u^{-1}}{-1}$

$u = \ln x$

$\to \lim_{a\to\infty} \frac{\ln x^{-1}}{-1} = \frac{-1}{\ln x} + C \quad du = \frac{1}{x}dx$

$\to \frac{-1}{\ln a} - \left(\frac{-1}{\ln 3}\right) = 0 + \frac{1}{\ln(3)} = \boxed{\text{CONVERGES AT } \frac{1}{\ln(3)}}$

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8) $\int_1^\infty \frac{1}{e^{5t}+2}$ BEHAVES LIKE $\frac{1}{e^{5t}}$ AND SINCE IN e^{-5t} THE $a = 5$ AND IT IS GREATER THAN ZERO WE KNOW IT CONVERGES

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14) $\int_0^1 \frac{1}{x^{19/20}}dx = \int_0^1 \frac{1}{x^{.95}}dx$ BECAUSE $P = .95$ AND IS LESS THAN ZERO WE KNOW THAT THIS FUNCTION CONVERGES

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