BC Calculus Chapter 8   ππ   Name______________
L'Hopital Rule, Improper Integrals   Date _________Pd.___

For Problems #1-6 find the limit using L'Hopital Rule if applicable:

(2p) 1) $\lim\limits_{x \to 1} \dfrac{e^x - e}{\ln x}$

(2p) 2) $\lim\limits_{x \to 2} \dfrac{\int_2^x \sin t\,dt}{x^2 - 4} =$

(3p) 3) $\lim\limits_{x \to \infty} \left(\dfrac{2x}{2x-1}\right)^x =$

(3p) 4) $\lim\limits_{x \to 4^+} \left(\dfrac{1}{\sqrt{x} - 2} - \dfrac{4}{x-4}\right) =$

(3p) 5) Determine which function increases more rapidly or if they grow at the same rate as x approaches infinity.

$f(x) = tan^{-1}(\frac{1}{x})$ and $g(x) = \frac{1}{x^2}$

(2p) 6) State whatever the improper integral converges or diverges. **Justify your answer.**

$$\int_1^{\infty} \frac{1}{x^{\frac{\pi}{4}}}\, dx$$

For problems # 7 and #8 evaluate each integral. State whatever the improper integral converges or diverges.

(4p) 7) $\int_{3}^{\infty} \frac{dx}{x^2 - 1}$

(2p) 8) $\int_{-1}^{1} \frac{dx}{x}$

For problems # 9 and #10, use the specified test to determine if the following integrals converge or diverge.

(3p) 9) $\int_0^{\infty} \frac{\cos x dx}{e^x + x^2}$ Direct Comparison Test

(3p) 10) $\int_1^{\infty} \frac{x^2}{\sqrt{x^6 - 1}}\, dx$ Limit Comparison Test