EMCF 31

Log into CourseWare at http://www.casa.uh.edu
and access the answer sheet by clicking on the EMCF tab.

NOTE: On all problems, choice F is "None of the above".

Important Facts: Aside from L'Hospital's rule, you can take advantage of the following information:

- $e^x$ grows much faster than any power of $x$ as $x \to \infty$, i.e. $\lim_{x \to \infty} \frac{e^x}{x^n} = \infty$ and $\lim_{x \to \infty} \frac{x^n}{e^x} = 0$ for every value of $n$ (even extremely large values!!).
- $\ln(x)$ grows much slower than any power of $x$ as $x \to \infty$, $\lim_{x \to \infty} \frac{\ln(x)}{x^r} = 0$ and $\lim_{x \to \infty} \frac{x^r}{\ln(x)} = \infty$ for any value of $r > 0$ (even very small values!!).
- A limit that is $\infty$, is one that does not exist.

1. $\lim_{x \to \infty} \frac{3x^3 + 2x^2}{e^x} =
   \begin{align*}
   &a. \ 3 \\
   &b. \ 2 \\
   &c. \ 1 \\
   &d. \ 0 \\
   &e. \ \text{DNE}
   \end{align*}$

2. $\int_{0}^{4} \frac{dx}{x-2}$ is an improper integral.
   
   A. True
   
   B. False

3. $\int_{2}^{6} \frac{dx}{x-2}$ is an improper integral.
   
   A. True
   
   B. False
4. \[ \int_{-\infty}^{2} e^{3x} \, dx \] is an improper integral.

A. True
B. False

5. \[ \left\{ \frac{n^{124}}{5^n} \right\}_{n=1}^{\infty} \]

A. Converges
B. Diverges

6. Evaluate \( \int_{0}^{\infty} \frac{1}{x^2 + 4} \, dx \).

A. \( \frac{\pi}{2} \)
B. \( \frac{\pi}{4} \)
C. \( 2\pi \)
D. The improper integral is divergent.

7. \( \lim_{x \to \frac{\pi}{2}} (\tan x)^{\cos x} = \)

A. 0
B. 1
C. e
D. \( \infty \)

8. Does \( \int_{1}^{\infty} \frac{1}{x} \, dx \) converge or diverge?

C. Converge
D. Diverge
9. Does \( \int_1^\infty \frac{1}{x^2} \, dx \) converge or diverge?
   C. Converge   D. Diverge

10. Does the sequence \( \left\{ \frac{1}{n} \right\}_{n=1}^\infty \) converge or diverge?
    C. Converge   D. Diverge