MATH 1300: HW #11

Due on April 6, 2017 at 10:00am

Professor Braden Balentine Section 005

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Section 4.5

42. Find the limit. Use l'Hospital's Rule where appropriate. If there is a more elementary method, consider using it. If l'Hospital's rule does not apply, explain why.

$$\lim_{x\to\infty}(1+\frac{a}{x})^{\frac{b}{x}}$$

54. Use lHospitals Rule to help find the asymptotes of f. Then use them, together with information from f' and f'', to sketch the graph of f. Check your work with a graphing device.

$$f(x) = xe^{-x^2}$$

64. Prove that

$$\lim_{x\to\infty}\frac{e^x}{x^n} = \infty$$

for any number $p > 0$. This shows that the logarithmic function approaches ∞ more slowly than any power of x.

66. If any object with mass m is dropped from rest, one model for its speed v after t seconds, taking air resistance into account, is

$$v = \frac{mg}{c}(1 - e^{-\frac{ct}{m}})$$

where g is the acceleration due to gravity and c is a positive constant.

(a) Calculate $\lim_{t\to\infty} v$. What is the meaning of this limit?

(b) For fixed t, use l'Hospital's Rule to calculate the limit of $\lim_{c\to 0^+} v$. What can you conclude about the velocity of a falling object in a vacuum?

73. If f' is continuous, $f(2) = 0$, and $f'(2) = 7$, evaluate

$$\lim_{x\to 0}\frac{f(2+3x)+f(2+5x)}{x}$$

1. $\lim_{x\to\frac{\pi}{2}}\frac{\sin(x)-1}{x}$ Not indeterminate
2. $\lim_{x\to\infty}(1+\frac{2}{x})^{3x}$
   - $\ln(L) = 3x\ln(1+\frac{2}{x})$
   - $\ln(L) = 3\infty\ln(1+\frac{2}{\infty})$
   - $\ln(L) = 3x\ln(1)$
   - $\ln(L) = \infty\cdot 0$
   - $0\cdot\infty$, so it is an indeterminate form.
3. $\lim_{x\to 0^+} x^{\sin(x)}$