PRACTICE PROBLEM SET 17

Now find these limits using L'Hôpital's Rule. The answers are in Chapter 21.

1. Find $\lim_{x\to 0} \frac{\sin 3x}{\sin 4x}$. $\frac{3\cos(3x)}{4\cos(4x)} = \frac{3}{4}$

2. Find $\lim_{x\to \pi} \frac{x-\pi}{\sin x}$. $\frac{1}{\cos x} = -1$

3. Find $\lim_{x\to 0} \frac{x-\sin x}{x^3}$. $\frac{1-\cos x}{3x^2} = \frac{\sin x}{6x} = \frac{\cos x}{6} = \frac{1}{6}$

4. Find $\lim_{x\to 0} \frac{e^{3x}-e^{5x}}{x}$. $\frac{3e^{3x}-5e^{5x}}{1} = -2$

5. Find $\lim_{x\to 0} \frac{\tan x - x}{\sin x - x}$. $= \frac{\sec^2 x - 1}{\cos x - 1} = \frac{2\sec x \sec x \tan x}{-\sin x} = \frac{-2}{\cos^3 x} = -2$

6. Find $\lim_{x\to \infty} \frac{x^5}{e^{5x}}$. $= \frac{5x^4}{5e^{5x}} = \frac{24x^3}{25e^{5x}} = \frac{60x^2}{125e^{5x}} = \frac{120x}{675e^{5x}} = \frac{120}{3375e^{5x}} = 0$

7. Find $\lim_{x\to \infty} \frac{x^5+4x^3-8}{7x^5-3x^2-1}$. . . . . $\frac{1}{7}$

8. Find $\lim_{x\to 0^+} \frac{\ln(\sin x)}{\ln(\tan x)}$. $\frac{\frac{\cos x}{\sin x}}{\frac{\sec^2 x}{\tan x}} = \frac{\cos x}{\sin x} \cdot \frac{\sin x \cos x}{1} = \cos^2 x = 1$

9. Find $\lim_{x\to 0^+} \frac{\cot 2x}{\cot x}$. $\frac{-2\csc^2(2x)}{-\csc^2(x)}$

$\frac{1}{\cos^2 x} \cdot \frac{\cos x}{\sin x}$

10. Find $\lim_{x\to 0^+} \frac{x}{\ln(x+1)}$.

$\frac{1}{\frac{1}{x+1}} = x+1 = 1$