Thursday, August 29

How is L'Hopital's rule different from taking the derivative using the quotient rule?

August 29 - Day 2

Students will verbally explain how to find the limit using L'Hopital's Rule

(using the words:
indeterminate, derivative, evaluate, limit...)

Which equation is equivalent to $y = x \tan x$?

$$y = \frac{\tan x}{\frac{1}{x}} = \tan x \left(\frac{x}{1}\right)$$

$$y = \frac{x}{\tan x}$$

$y = x \cot x$

$$y = \frac{\tan x}{x}$$

Which equation is equivalent to $y = x \ln x$?

$$y = \frac{\ln x}{\frac{1}{x}}$$

$$y = \frac{x}{\ln x}$$

$y = 1\left(\frac{1}{x}\right)$

$$y = \frac{\ln x}{x}$$

Which equation is equivalent to $y = e^{-x}\left(x^3 - x^2 + 9\right)$?

$$y = \frac{x^3 - x^2 + 9}{e^x} = \frac{x^3 - x^2 + 9}{\frac{1}{e^{-x}}}$$

$$y = \frac{e^{-x}}{x^3 - x^2 + 9} \qquad y = e^x\left(x^3 - x^2 + 9\right)$$

$$y = \frac{x^3 - x^2 + 9}{e^{-x}} \qquad y = \frac{e^x}{x^3 - x^2 + 9}$$

Write an equation that is equivalent to $y = \frac{1}{x}\tan x$

$$y = \frac{\tan x}{x}$$

Write an equation that is equivalent to $y = x\left(e^{-x}\right)$

$$y = \frac{e^{-x}}{\frac{1}{x}} \qquad \frac{x}{e^x}$$

$\lim_{x\to 0} \frac{1}{x}\tan x$ $= \infty \cdot 0$ (indeterminate)

$\lim_{x\to 0} \frac{\tan x}{x} = \frac{0}{0}$

L'Hopital

$\lim_{x\to 0} \frac{\sec^2 x}{1} = 1$

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#1-33 (odd)
37-45 (odd)
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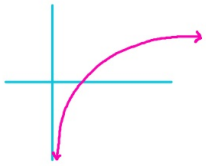
$\lim_{x\to 0} x \ln x$ $= 0 \cdot (-\infty)$ indeterminate



$\lim_{x\to 0} \frac{\ln x}{\frac{1}{x}} = \frac{-\infty}{\infty}$

L'Hôpital

$\frac{1}{x} = x^{-1}$

$\lim_{x\to 0} \frac{\frac{1}{x}}{-x^{-2}} = \lim_{x\to 0} \frac{\frac{1}{x}}{\frac{-1}{x^2}} = \lim_{x\to 0} \frac{1}{x} \cdot \frac{x^2}{-1} = \lim_{x\to 0} -x = -0$