$\frac{d}{dx}[e^x] = e^x$ $\frac{d}{dx}[e^{u(x)}] = e^{u(x)} u'(x)$

Chain Rule

§ 7.4 Separable?

$y'(x) = \frac{dy}{dx}$ Student Sol'ns ?

(17) $y'(x) = 2x\sqrt{1-y^2}$

$\frac{dy}{dx} = 2x\sqrt{1-y^2}$

$\int \frac{dy}{\sqrt{1-y^2}} = \sin^{-1}(x) + C$

$\int \frac{dy}{\sqrt{1-y^2}} = \int 2x\, dx$

$\sin^{-1}(y) = x^2 + C$

$\sin(\quad) = \sin(\quad)$

$y = \sin(x^2+c)$

$= \sin x^2 \cos c + \sin c \cos x^2$

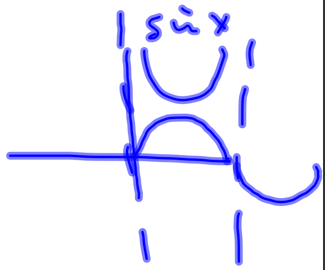
$= C_1 \sin(x^2) + C_2 \cos(x^2)$

Maybe some in-class 7.4 work this week.

L'Hôpital

$\infty - \infty$

$$\lim_{x\to 0^+}\left(\frac{3x+1}{x}-\frac{1}{\sin x}\right)$$



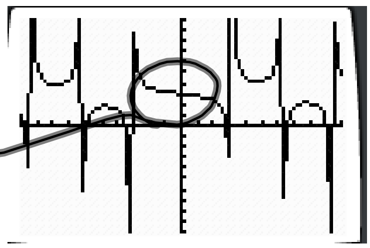
$$=\lim_{x\to 0^+}\left(\frac{(3x+1)\sin x - x}{x\sin x}\right) \qquad \frac{0}{0}$$

$$=\lim_{x\to 0^+}\left(\frac{3\sin x + (3x+1)\cos x - 1}{\sin x + x\cos x}\right)$$

$$=\lim_{x\to 0^+}\left(\frac{3\overset{1}{\cos} x + 3\overset{1}{\cos} x - (3x+1)\overset{0}{\sin} x}{\cos x + \cos x - x\sin x}\right)$$

$$= \frac{6-0}{2} = 3\ ?$$

Confirmed by Grapher.



$$\lim_{t\to\infty} \frac{e^t}{t} = \lim_{t\to\infty} \frac{e^t}{1} = \infty$$

$$\lim_{t\to\infty} \frac{e^t}{t^2} = \lim_{t\to\infty} \frac{e^t}{2t} = \lim_{t\to\infty} \frac{e^t}{2} = \infty$$

$$\frac{e^t}{t^n} = \cdots = \frac{e^t}{n(n-1)(n-2)\cdots(2)(1)} = \frac{e^t}{n!}$$

For fixed n, this $\xrightarrow{t\to\infty} \infty$

$$\lim_{x \to 3} \frac{x-3}{x^2+2x-15} = \lim_{x \to 3} \frac{x-3}{(x-3)(x+5)}$$

$$= \lim_{x \to 3} \frac{1}{x+5} = \frac{1}{8}$$

$$\lim_{x \to 3} \frac{x-3}{x^2+2x-15} = \lim_{x \to 3} \frac{1}{2x+2} = \frac{1}{2(3)+2} = \frac{1}{8}$$

Jan 22-12:40 PM

§7.4 Exponential Decay Question

A sample of Millsium contains 37% of the radioactive Millsium found in nature. How long has the critter been dead?

$\frac{1}{2}$-life is 70 yrs.

≈ 100 yrs.

$A(t) = Ce^{kt}$

$Ce^{70k} = \frac{1}{2}C$

A is amt of radioactive Millsium $Ce^{kt} = .37C$

Next time: $\arcsin(x) = \sin^{-1}(x)$ = inverse sine. Not to be confused with $\csc x = \frac{1}{\sin x} = \sin^{-1}(x)$!?

Context decides.

Jan 22-12:51 PM