WARMUP!!

2013 #3

No extrema b/c $f'(x)$ is always > 0.

P.O.I. occurs at $(0, 0)$ b/c $f''(x)$ chgs sign.

2nd WARMUP!!

Find all extrema and points of inflection for

$$f(x) = \frac{e^x - e^{-x}}{2} = \frac{1}{2}(e^x - e^{-x})$$

$$f'(x) = \frac{1}{2}(e^x + e^{-x}) = \frac{1}{2}\left(e^x + \frac{1}{e^x}\right)$$

$$= \frac{1}{2}\left(\frac{e^{2x}+1}{e^x}\right) \quad e^{2x}+1=0 \quad \cancel{e^{2x}=-1} \quad \cancel{e^x=0}$$

$$f''(x) = \frac{1}{2}(e^x - e^{-x}) = \frac{1}{2}\left(e^x - \frac{1}{e^x}\right)$$

$$= \frac{1}{2}\left(\frac{e^{2x}-1}{e^x}\right) \quad e^{2x}=1 \quad \cancel{e^x=0}$$

$$2x = \ln 1$$

$$2x = 0 \rightarrow x = 0$$

f'': $-$ | $+$; $\cap$ 0 $\cup$

No extrema b/c f'(x) is always > 0.

P.O.I. occurs at (0, 0) b/c f''(x) chgs sign.

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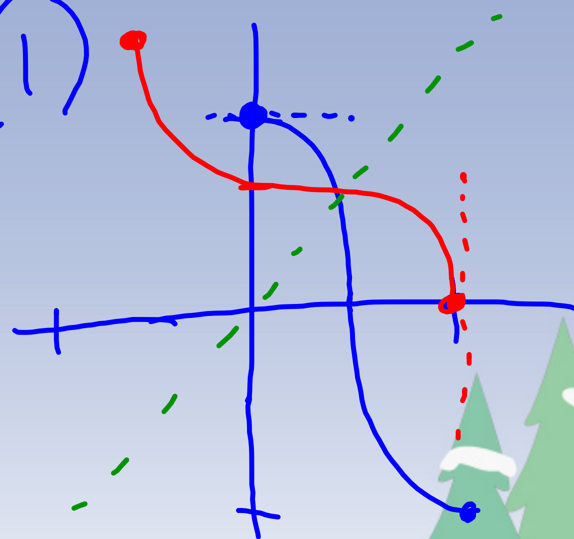
5-3

$f(x) = \cos 2x \quad \left[0, \frac{\pi}{2}\right] \quad a = 1$

find $(f^{-1})'(1)$



$\cos 2x = 1$

$2x = 0$

$x = 0$

$f'(x) = -2\sin 2x$

$f'(0) = 0$

$\frac{1}{0}$ ☹

31 $\left(1+\frac{1}{1000000}\right)^{1000000} < e$

43 $y = \frac{2}{e^x + e^{-x}}$

$$y' = \frac{0 - 2(e^x - e^{-x})}{(e^x + e^{-x})^2}$$

$$= \frac{-2e^x + 2e^{-x}}{(e^x + e^{-x})^2}$$

5.4b Integral of e^x!

At the end of this lesson you will be able to:

> integrate functions involving e^x

Warmup #2: Complete the following:

$\int e^x dx = e^x + C$ $\int e^u du = e^u + C$

ex) $\int e^{(3x+1)} dx$

3 methods

1) shortcut $= \frac{1}{3}e^{(3x+1)} + C$

2) $u = 3x+1$
$du = 3dx$
$\frac{1}{3}du = dx$

$= \frac{1}{3}\int e^u du = \frac{1}{3}e^u + C$
$= \frac{1}{3}e^{(3x+1)} + C$

3) $u = e^{(3x+1)}$
$du = 3e^{(3x+1)}dx$
$\frac{1}{3}du = e^{(3x+1)}dx$

$= \frac{1}{3}\int du = \frac{1}{3}u + C$
$= \frac{1}{3}e^{(3x+1)} + C$

You try! Integrate the following:

1) $\int \cos x e^{\sin x} dx = e^{\sin x} + C$

2) $\int \frac{e^x}{2+e^x} dx = \int \frac{1}{u} du = \ln|u| + C$

$= \ln|2+e^x| + C$

$u = 2+e^x$

$du = e^x du$

3) $\int e^x \cos(e^x) dx = \int \cos u \, du$

$= \sin u + C$

$= \sin(e^x) + C$

$u = e^x$

$du = e^x dx$

Let's do some review!!

1) $\int \frac{x-2}{(2x+1)^2}dx =$

2) Find dy/dx if $y = \ln\left(\frac{e^x + e^{-x}}{2}\right)$

3) Solve for x if $23 = \sqrt{2^8 + 7^x}$

4) Write the equation of the line tangent to $y = 3e^{-2x} + 6$ at the point where $x = 0$.

1) $1/4 \ln|2x + 1| + 5/(8x + 4) + C$

2) $(e^{2x} - 1) / (e^{2x} + 1)$

3) $x = \ln 273 / \ln 7$

4) $y = -6x + 9$

What have we learned?

- Can I integrate functions involving e^x?