MIRACOSTA COLLEGE

Student: ______ Notetaker: Krystal

Class: Math 150 Day/Date: May 8, 2009

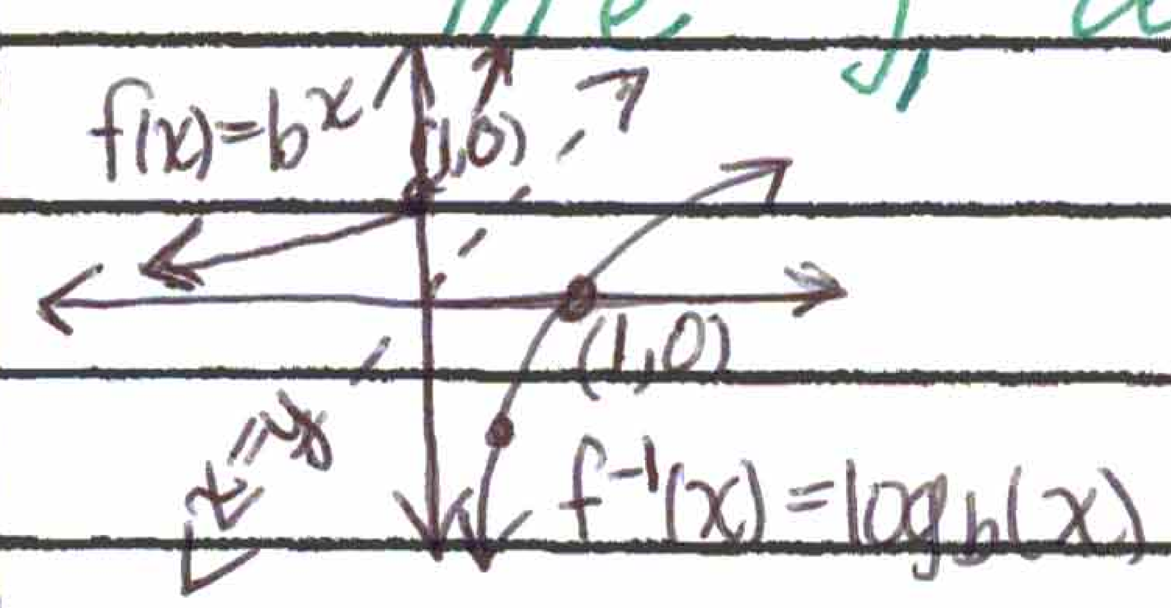
$\frac{dx}{dy} = \frac{1}{m} \frac{(run)}{(rise)}$

$\boxed{\text{Chapter 5}}$

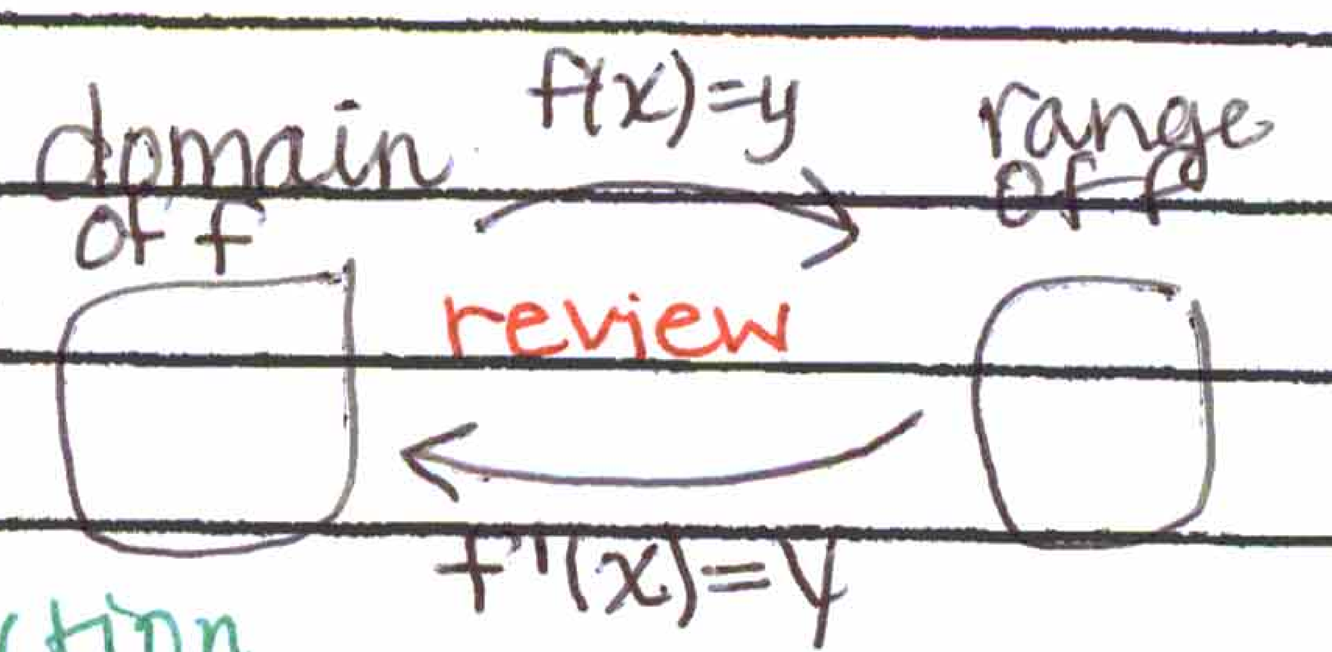
(1) $\log_b(1) = 0$
(2) $\log_b(AB) = \log_b A + \log_b B$
(3) $\log_b(A^n) = n \log_b A$
(4) $\log_b(A/B) = \log_b A - \log_b B$
(5) $\log_B(A) = \frac{\log_x A}{\log_x B}$ $x>0, x \neq 1$

Definition of e

The letter e denotes the positive real # such that $\ln e = \int_1^e dt = 1$




all x's + y's trade position




$f(f^{-1}(x)) = x$
$f^{-1}(f(x)) = x$

5.3 Existence of an Inverse function

A. f must pass horizontal line test
B. f must be a one-to-one

Guidelines for finding an inverse fn

$f(x) = 3/4x + 5$

① $y = 3/4x + 5$

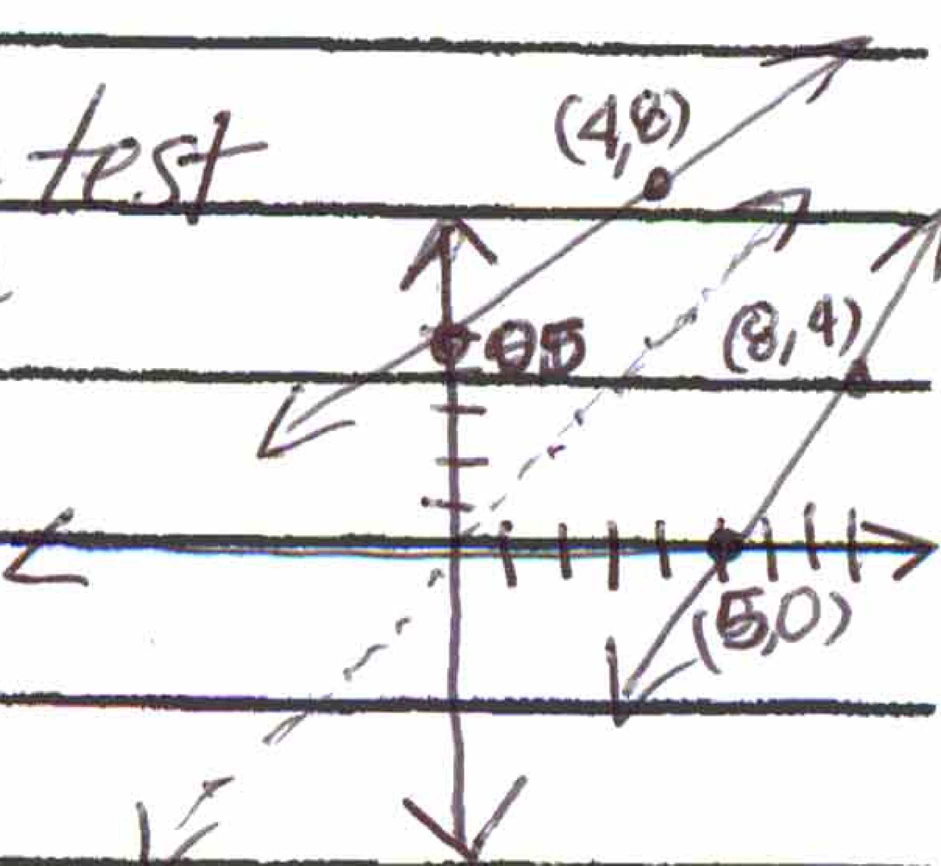
② $x = 3/4y + 5$

③ Solve for y

$x - 5 = 3/4y + 5 - 5$

$4/3(x-5) = 3/4y \cdot 4/3$

$\frac{4x}{3} - \frac{20}{3} = y$




$f^{-1}(x) = \frac{4x}{3} - \frac{20}{3}$

↑ concept is on final ↑

(G) calc. P2

MIRACOSTA COLLEGE

Student: 

Notetaker: 

Class: 

Day/Date: 

Graph inverse $f^n$ on Ⓖcalc.

$Y=$

$\boxed{2nd} \rightarrow \boxed{DRAW} \rightarrow \boxed{8{:}DRAWINV} \boxed{Y_1}$

$\frac{d}{dx}(3/4^x) = 3/4^x \ln 3/4$

$\frac{d}{dx}(2^x) = 2^x \ln 2$

Integrals of the Six Basic Trig $f^n$s (p337) - familiarize

Derivative of an Inverse $f^n$

tip, let $g(x) = $ "$f^{-1}(x)$" ← difficult to solve for-

do not apply differential to power rule + use substitution

$$\frac{d}{dx}[f^{-1}(x)] = \frac{d}{dx}[g(x)]$$

Important: ~~but~~ if $y = f^{-1}(x)$

then $f(y) = f(f^{-1}(x))$

$f(y) = x$

Chain $\frac{d}{dx}[f(y)] = \frac{d}{dx}x$

$f'(y) \cdot \frac{dy}{dx} = \frac{dx}{dx}$

$f'(y) \cdot \frac{dy}{dx} = 1$

$\frac{dy}{dx} = \frac{1}{f'(x)}$

$\frac{d}{dx}[f^{-1}(x)] = \frac{1}{f'(x)}$

memorize

$$\boxed{\begin{gathered} f(f^{-1}(x)) = x \\ f^{-1}(f(x)) = x \end{gathered}}$$

let $f(x) = b^x$  $b > 0$, $b \neq 1$

$f'(x)$

$\frac{d}{dx}[f(x)] = \frac{d}{dx}(b^x)$

Let $y = b^x$

$\ln(y) = \ln(b^x)$

$\ln(y) = x\ln(b)$

$\frac{d}{dx}\ln y = \frac{d}{dx}(x\ln b)$

$1/y \cdot dy/dx = \ln b$

$dy/dx = y\ln(b) = b^x \ln b$

* derivative of a function is its $f^n$

$\frac{d}{dx}e^x = e^x$

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

MIRACOSTA COLLEGE

S dent: ______ Notetaker: Krystal

Class: ______ Day/Date: ______

$\boxed{d/dx[\cos^{-1}(x)]}$ ← don't like $f^{-1}$ notation

Let $y=\cos^{-1}(x)$

$\cos(y)=\cos(\cos^{-1}(x))$

Implicit differentiation & chain rule

$\cos(y)=x$

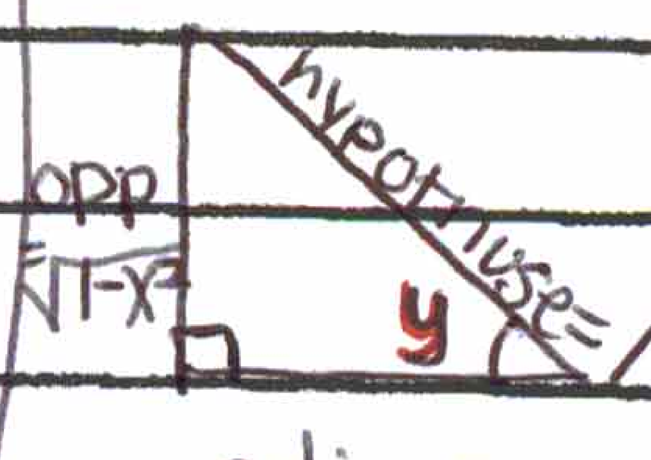
$d/dx(\cos(y))=d/dx(x)$

$-\sin(y)\cdot dy/dx=1$

$$\boxed{\frac{dy}{dx}=\frac{-1}{\sin(y)}}$$

$$\frac{dy}{dx}=\frac{1}{-\sin(\cos^{-1}(x))}$$

convert on tria




$\cos y=\frac{x}{1}=\frac{adj}{hyp}$ pathagorean theorem.

$$\frac{d}{dx}[\cos^{-1}(x)]=\frac{1}{-\sqrt{1-x^2}}$$

Definition of natural Exponential fn

S, to memorize Definition of Inverse Trigonometric $f^{ns}$ (pg 371)

- the graphs p. 372

Derivatives of Inverse Trig functions (pg 374)

$\frac{d}{dx}(\cot^{-1}(x))=$

Let $y=\cot^{-1}(x)$

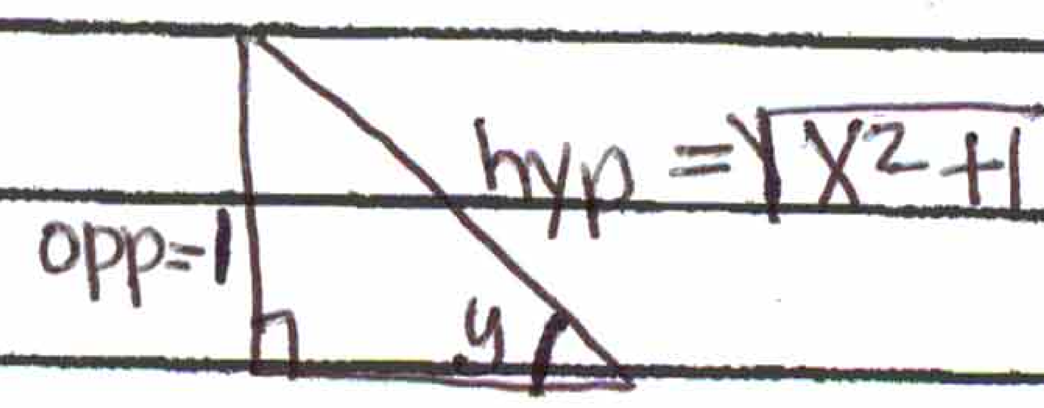
$\cot(y)=\cot(\cot^{-1}(x))$

* $\cot(y)=x$ *

$\frac{d}{dx}[\cot(y)]=\frac{d}{dx}[x]$

$-\csc^2 y\, dy/dx=1$

$dy/dx=1/-\csc^2 y$




* $\cot(y)=\frac{x}{1}$ *

$\cot(y)=\frac{adj}{opp}$

$x^2+1^2=hyp^2$

$\sqrt{x^2+1}=hyp$

$d/dx(\cot^{-1}(x))=-1/x^2+1$

$\frac{1}{-\csc^2 y}=\frac{1}{-(1/\sin^2 y)}=-\sin^2 y$

Check

$-\left(\frac{opp}{hyp}\right)^2=-\left(\frac{1}{\sqrt{x^2+1}}\right)^2=\frac{-1}{x^2+1}$

MIRACOSTA COLLEGE

Student:  Notetaker: Krystal

Class:  Day/Date:

pg 376 Basic Differentiation Rules for Elementary Functions

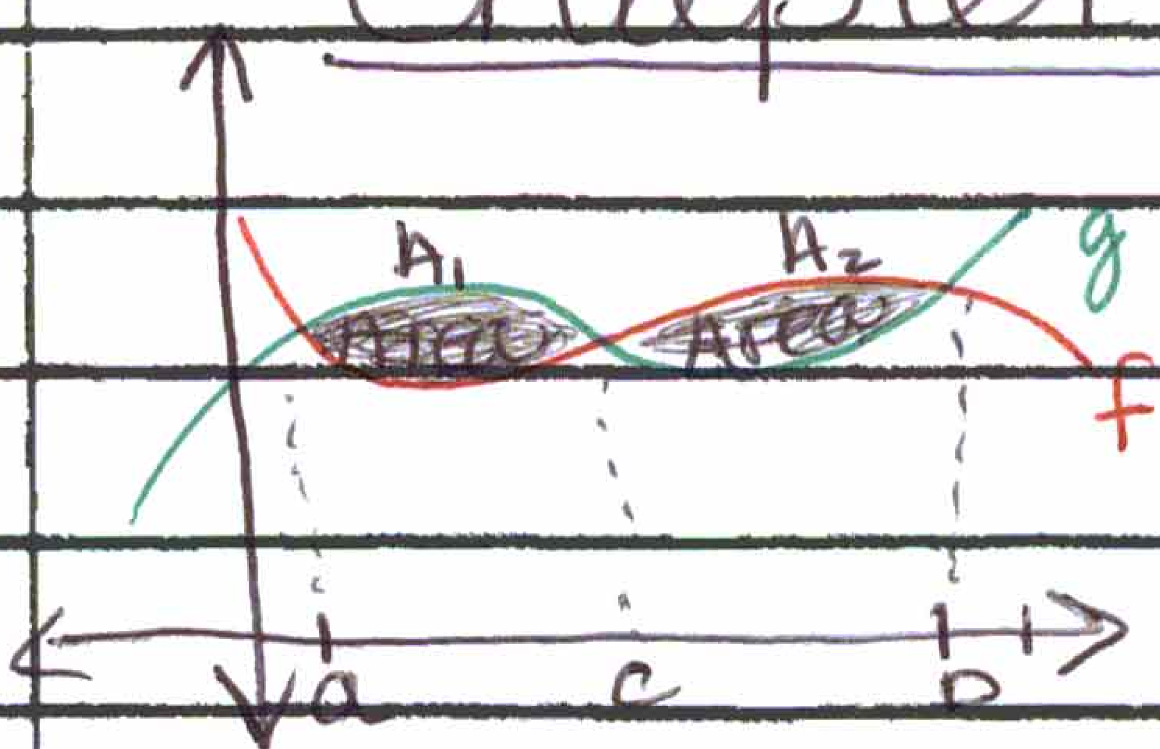
$$\int \frac{d}{dx}[\cot^{-1}x]\,dx = \int \frac{-1}{x^2+1}$$

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

maintain esp. chapter 5 for Calculus 2!

(not on final)

## Chapter 7




$$\int_a^c [g(x)-f(x)]\,dx + \int_c^b [f(x)-g(x)]\,dx$$

$A = A_1 + A_2$

$= \int_a^c [g(x)-f(x)]\,dx$

5.2 #53

$$\int_1^2 \frac{1-\cos(\theta)}{\theta-\sin(\theta)}\,d\theta = \int_{1-\sin 1}^{2-\sin 2}\left(\frac{\cancel{1-\cos\theta}}{u}\right)\left(\frac{du}{\cancel{1-\cos\theta}}\right)$$

let $u = \theta - \sin\theta$

$\frac{du}{d\theta} = 1-\cos\theta$

$d\theta = \frac{du}{1-\cos\theta}$

upper $\theta = 2$ lower $\theta = 1$

$u = 2-\sin 2$ $u = 1-\sin 1$

$$= \int_{1-\sin 1}^{2-\sin 2} \frac{1}{u}\,du = \Big[\ln|u|\Big]_{1-\sin 1}^{2-\sin 2}$$

$$= \boxed{\ln|2-\sin 2| - \ln|1-\sin 1|}$$ Acceptable for Bonds

$$\boxed{\ln\frac{2-\sin 2}{1-\sin 1}}$$ simplified

5.1 #85

$y = x\ln x$

$y' = (x)\frac{d}{dx}(\ln x) + (\ln x)\frac{d}{dx}(x)$

$y' = (\cancel{x})(1/\cancel{x}) + (\ln x)(1)$

$y' = 1 + \ln x$

$\ln x = -1$ $x = \frac{1}{e}$

$y' = 1 + \ln x$ ← find critical #s

$y'' = \frac{d}{dx}(1+\ln x)$

$y'' = 0 + 1/x$

$y'' = 1/x$ ← find P.P.I.

$y''(1/e) = e^+ > 0$ concave up

MIRACOSTA COLLEGE

Student:

Notetaker: Krystal

Class: Math 150

Day/Date: May 8, 09

5.4 #36 $y = e^{-x^2}$

let $u = -x^2$

$du/dx = -2x$

$dx = du/-2x$

so $y = e^u$

$d/dx\, y = d/dx(e^u)$

$dy/dx = e^u\, du/dx$

$dy/dx = e^{-x^2}(-2x)$

Perferred method for now

$= \boxed{-2xe^{-x^2}}$

$\frac{d}{dx} y = \frac{d}{dx}(e^{-x^2})$

$\frac{dy}{dx} = (e^{-x^2}) \frac{d}{dx}(-x^2)$

$d/dx(e^x) = e^x$

or $\ln(y) = -x^2$

$d/dx[\ln(y)] = d/dx(-x^2)$

$y \cdot 1/y \cdot dy/dx = -2xy$

$\boxed{dy/dx = -2xe^{-x^2}}$

get this technique logarithmic differentiation

If $y = \pi^x$ find $\frac{dy}{dx}$

$\ln(y) = \ln(\pi^x)$

$\ln(y) = x\ln(\pi)$

$d/dx[\ln(y)] = d/dx[x \cdot \ln(\pi)]$

$y \cdot 1/y \cdot dy/dx = \ln\pi \cdot y$

$dy/dx = \ln\pi \cdot \pi^x$

VARIABLE EXPONENT use natural log

let the function tell you which approach

5.4 #90

$\int \frac{e^{2x}}{1+e^{2x}}\,dx$

let $u = 1 + e^{2x}$

$= \int \frac{\cancel{e^{2x}}}{u} \frac{du}{2\cancel{e^{2x}}}$

$\frac{du}{dx} = (e^{2x})\frac{d}{dx}(2x)$

$= \int \frac{1}{u}\frac{du}{2}$

$\frac{du}{dx} = 2e^{2x}$

$= \frac{1}{2}\ln|u| + C$

$dx = \frac{du}{2e^{2x}}$

$= \frac{1}{2}\ln|1+e^{2x}| + C$