

Homework #7



#HW #7

2.8.1 Explicit

$$x^3 y - 4\sqrt{x} = x^2 y \quad \text{at } (2, \sqrt{2})$$

$$-4\sqrt{x} = x^2 \cdot y' - x^2 y'$$

$$-4\sqrt{x} = y'(x^2 - x^3)$$

$$\Rightarrow y' = \frac{-4\sqrt{x}}{x^2 - x^3}$$

$$y' = \frac{-2x^{-1/2}(x^2 - x^3) - (2x + 3x^2)}{(x^2 - x^3)^2}$$

$$y' = \frac{-2(x^2 - x^3) - \sqrt{x}(2x + 3x^2)}{\sqrt{x}(x^2 - x^3)^2}$$

$$y' = \frac{-2x^2(1-x) - x\sqrt{x}(2+3x)}{\sqrt{x}(x^2 - x^3)^2}$$

$$\text{at } (2, \sqrt{2}) \text{ Slope} = \frac{-2 \cdot 2^2(1-2) - 2\sqrt{2}(2+3 \cdot 2)}{\sqrt{2}(2^2 - 2^3)^2}$$

$$= \frac{8 - 16\sqrt{2}}{16\sqrt{2}} = \frac{1 - 2\sqrt{2}}{2\sqrt{2}}$$

$$\text{So: Tangent line: } y = \frac{1 - 2\sqrt{2}}{2\sqrt{2}}(x - 2) + \sqrt{2}$$

2.8-2



slope at $(2, \sqrt{2})$

implicit

$$\frac{d}{dx}(x^3y - 4\sqrt{x}) = \frac{d}{dx}(x^2y)$$

$$\left[x^3 \left(\frac{dy}{dx} \right) + y(3x^2) \right] - 4 \left(\frac{1}{2} x^{-1/2} \right) = \left[x^2 \left(\frac{dy}{dx} \right) + y(2x) \right]$$

$$x^3 \frac{dy}{dx} + 3x^2y - 2x^{-1/2} = x^2 \frac{dy}{dx} + 2xy$$

$$-3x^2y + 2x^{-1/2} = -3x^2y + 2x^{-1/2}$$

$$x^3 \frac{dy}{dx} = x^2 \frac{dy}{dx} + 2xy - 3x^2y + 2x^{-1/2}$$

$$-x^2 \frac{dy}{dx} \quad -x^2 \frac{dy}{dx}$$

$$x^3 \frac{dy}{dx} - x^2 \frac{dy}{dx} = 2xy - 3x^2y + 2x^{-1/2}$$

$$\frac{dy}{dx}(x^3 - x^2) = \frac{2xy - 3x^2y + 2x^{-1/2}}{x^3 - x^2}$$

$$\frac{dy}{dx} = \frac{2xy - 3x^2y + 2x^{-1/2}}{x^3 - x^2}$$

$$\frac{dy}{dx} = \frac{2(2)(\sqrt{2}) - 3(2^2)(\sqrt{2}) + 2(2)^{-1/2}}{(2)^3 - (2)^2}$$

compute the slope of the tangent line
at the given point both explicitly (first
solve for y as a function of x and implicitly)

Ⓟ G K

$$\# 4 \quad y^2 + 2xy + 4 = 0 \quad \text{at } (-2, 2)$$

$$2y \cdot y' + 2y + 2x \cdot y' = 0$$

$-2y \qquad \qquad \qquad -2y$

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

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



DP - Deutsche Produktion

p. 191 / section 2.8/8

$$\sin(xy) = x^2 - 3$$

$$\cos(xy) \cdot \left[x \left(\frac{dy}{dx} \right) + y \right] = 2x \quad \begin{array}{l} \text{chainrule} \\ + \\ \text{productrule} \end{array}$$

$$x \left[\frac{dy}{dx} \right] + y = \frac{2x}{\cos(xy)}$$

$$\frac{dy}{dx} = \left[\frac{2x}{\cos(xy)} \right] - y$$

Double Plus
HW # 2

2.8 find the derivative $y'(x)$ implicitly

$$\#6) \quad 3xy^2 - 4x = 10y^2$$

$$\frac{d}{dx}(3xy^2) - \frac{d}{dx}(4x) = \frac{d}{dx}(10y^2)$$

$$\frac{d}{dx}(3x)(y^2) + \frac{d}{dx}(y^2)(3x) \quad \downarrow \quad \downarrow$$
$$3y^2 + (9xy^2)y'(x) - 4 = 20y^2$$

$$3y^2 + (9xy^2)y'(x) = 20y^2 - 4$$

$$(9xy^2)y'(x) = 20y^2 - 4 - 3y^2$$

$$y'(x) = \frac{20y^2 - 4 - 3y^2}{9xy^2}$$

Investment Banker

2.8

$$10) 3x + y^3 - \frac{4y}{x+2} = 10x^2$$

Find the derivative $\frac{dy}{dx}$ implicitly.

$$3x(x+2) + y^3(x+2) - 4y = 10x^2(x+2)$$

$$3x^2 + 6x + xy^3 + 2y^3 - 4y = 10x^3 + 20x^2$$

Implicit Diff.

$$6x + 6 + y^3 + 3xy^2 \frac{dy}{dx} + 6y^2 \frac{dy}{dx} - 4 \frac{dy}{dx} = 30x^2 + 40x$$

Product Rule

$$3xy^2 \frac{dy}{dx} + 6y^2 \frac{dy}{dx} - 4 \frac{dy}{dx} = 30x^2 + 34x - 6 - y^3$$

$$\frac{dy}{dx} (3xy^2 + 6y^2 - 4) = 30x^2 + 34x - 6 - y^3$$

$$\frac{dy}{dx} = \frac{30x^2 + 34x - 6 - y^3}{3xy^2 + 6y^2 - 4}$$

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$$xe^y - 3y \sin x = 1$$

$$\left(\frac{dy}{dx}\right) xe^y - \left(\frac{dy}{dx}\right) (3y) \cdot \sin(x) + \left(\frac{dy}{dx}\right) (\sin) \cdot 3y = \left(\frac{dy}{dx}\right) 1$$

$$1e^y - (1) \cdot \sin(x) + \cos \cdot 3y = 0$$

$$e^y - \sin(x) + 3y \cos = 0$$

Section 2.9

2

hyperbolic Cosine

2. $f(x) = \cosh 3x$

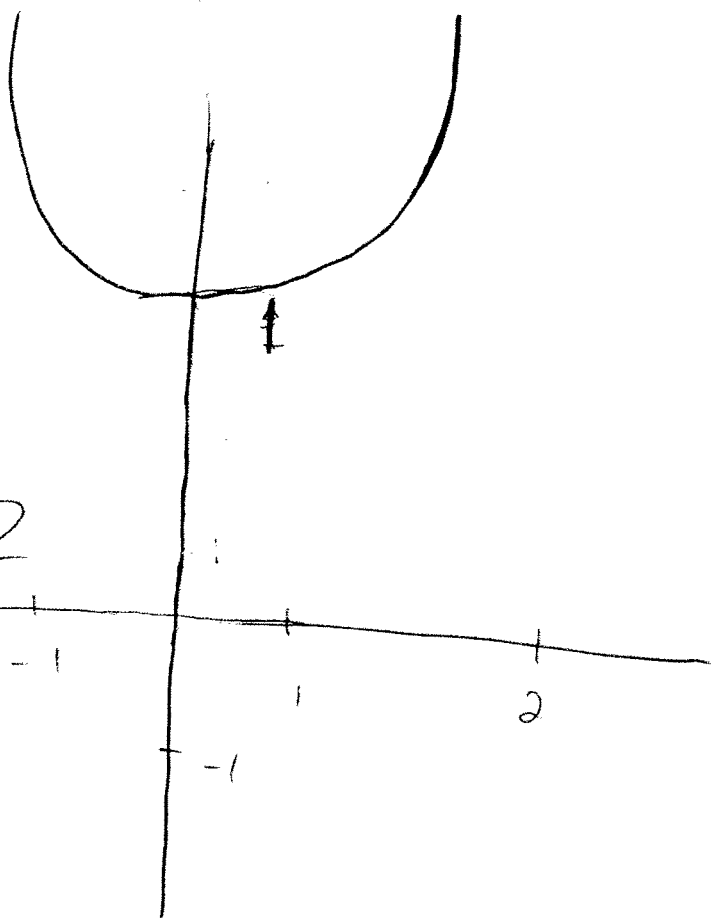
$= 3 \sinh(3x)$

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

$$\cosh 3x = \frac{e^{3x} + e^{-3x}}{2}$$

Calc

$$y_1 = \frac{(e^{3x} + e^{-3x})}{2}$$



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PURPLE PARROTS

2.9 # 6

$$a) f(x) = \sinh(\sqrt{x})$$

$$f'(x) = \cosh(\sqrt{x}) \cdot \frac{1}{2} x^{-\frac{1}{2}}$$

$$f'(x) = \cosh(\sqrt{x}) \cdot \frac{1}{2\sqrt{x}}$$

$$f'(x) = \frac{\cosh(\sqrt{x})}{2\sqrt{x}}$$

$$b) f(x) = \sqrt{\sinh(x)}$$

$$f'(x) = \frac{1}{2} (\sinh(x))^{-\frac{1}{2}} \cdot \cosh(x)$$

$$f'(x) = \frac{1}{2\sqrt{\sinh(x)}} \cdot \cosh(x)$$

$$f'(x) = \frac{\cosh(x)}{2\sqrt{\sinh(x)}}$$

11.

$$\frac{d}{dx} \left(\frac{\sin(4x+7)}{x^2} \right) =$$

$$= \frac{x \cos(4x+7) \cdot 4 - \sin(4x+7)}{2}$$

we used quotient rule.

$$= \ln(x) (\sin^{-1}(e^{2x}))' + \sin^{-1}(e^{2x}) (\ln x)'$$

$$= \ln x \frac{1}{\sqrt{1-(e^{2x})^2}} (e^{2x})' + \sin^{-1}(e^{2x}) \frac{1}{x}$$

$$= \ln \frac{1}{\sqrt{1-e^{2x}}} e^{2x} \cdot 2 + \frac{\sin^{-1}(e^{2x})}{x}$$

Product rule

#12. Sample test.

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Bios

Evaluate the limits:

$$\#1d \ a. \lim_{x \rightarrow \infty} \frac{9x^{20} - 5x + 6}{x^{20} - 9} = \lim_{x \rightarrow \infty} \frac{\frac{0.9x^{20}}{x^{20}} - \frac{5x}{x^{20}} + \frac{6}{x^{20}}}{\frac{x^{20}}{x^{20}} - \frac{9}{x^{20}}} = \frac{0.9}{1-0} = 0.9$$

$$\lim_{x \rightarrow \infty} \frac{-9x^{200} - 5x + 6}{x^{20} - 9} = \lim_{x \rightarrow \infty} \frac{-9x^{180} - \frac{5}{x^{19}} + \frac{6}{x^{20}}}{1 - \frac{9}{x^{20}}} = \lim_{x \rightarrow \infty} -9x^{180} = -\infty$$

$$\lim_{x \rightarrow \infty} \frac{9x^{20} - 5x + 6}{x^{200} - 9} = \lim_{x \rightarrow \infty} \frac{\frac{9}{x^{180}} - \frac{5}{x^{19}} + \frac{6}{x^{200}}}{1 - \frac{9}{x^{200}}} = 0$$

$$\lim_{x \rightarrow \infty} \frac{-0.9x^{21} - 5x + 6}{x^{20} - 9} \rightarrow \lim_{x \rightarrow \infty} \frac{-0.9x - \left(\frac{5x}{x^{20}}\right) - \left(\frac{6}{x^{20}}\right)}{1 - \left(\frac{9}{x^{20}}\right)} = \frac{-0.9x}{1} \rightarrow -\infty$$