Warm Up

For $x^3 + y^3 = 6xy$, find the equation of the tangent line at (3,3)

$3x^2 + 3y^2 \frac{dy}{dx} = 6y + 6x\frac{dy}{dx}$

$\frac{dy}{dx}(3y^2 - 6x) = 6y - 3x^2$

$\frac{dy}{dx} = \frac{6y - 3x^2}{3y^2 - 6x}$ @ (3,3) $m = \frac{6(3) - 3(3)^2}{3(3)^2 - 6(3)}$

$m = \frac{18 - 27}{27 - 18}$

$m = -1$

$y - y_1 = m(x - x_1)$

$y - 3 = -1(x - 3)$

$y - 3 = -x + 3$

$y = -x + 6$

$\frac{dy}{dx}$ is undefined

Find all points where the tangent line to $y^3 - xy = -6$ is either horizontal or vertical.

$\frac{dy}{dx} = 0$

$3y^2\frac{dy}{dx} - \left(y + x\frac{dy}{dx}\right) = 0$

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

$\frac{dy}{dx} = \frac{y}{3y^2 - x}$

Horizontal: $m = 0$

Set num = 0

$y = 0$

$y^3 - xy = -6$

$y(y^2 - x) = -6$

$y = 0$ will not work

No solutions

Vertical: m is undefined

Set den = 0

$3y^2 - x = 0 \Rightarrow 3y^2 = x$

$y^3 - xy = -6$

$y^3 - (3y^2)(y) = -6$

$y^3 - 3y^3 = -6$

$\frac{-2y^3}{-2} = \frac{-6}{-2}$

$y^3 = 3$

$y = \sqrt[3]{3}$

$x = 3\left(\sqrt[3]{3}\right)^2$

$x = 3^{\frac{3}{3}}\left(3^{\frac{2}{3}}\right) = 3^{\frac{5}{3}}$

$\left(3^{\frac{5}{3}}, \sqrt[3]{3}\right)$

Topics to Review:

- Power rule, product rule, quotient rule, chain rule
- Derivatives of trigonometric functions
- Applications of derivatives...
  *slopes of tangent lines
  *rectilinear motion
- Implicit differentiation
- Higher order derivatives

Review Questions...

Page 112 - 114
#1 c, d
#7 b, d
#8 b, d
9 a, b, d, f
#11
#12

Bonus #13

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#1 (ii)
#3
#4
#5

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#2
#3

Test:

Tuesday, November 15