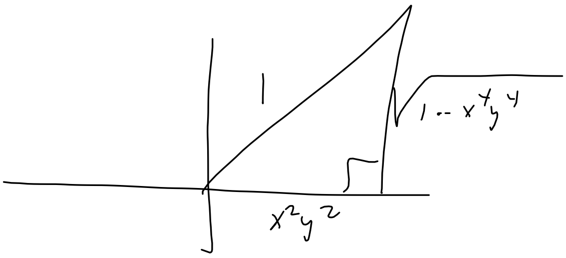
$\arccos(x^2y^2)$



What's with the triangle play, dumb-ass?

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

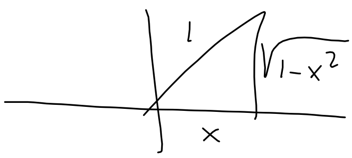
$$\Rightarrow \quad x = \cos(y)$$

$$\frac{d}{dx}[x] = 1 = \frac{d}{dx}[\cos(y)] = -\sin(y)\,\frac{dy}{dx}$$

↳ Chain Rule

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

$$= \frac{-1}{\sin(\arccos(x))} = \frac{-1}{\sqrt{1-x^2}}$$



§14.7 #11

$f(x,y) = x^3 - 12xy + 8y^3$

$f_x = 3x^2 - 12y \Rightarrow f_{xx} = 6x$

$f_y = -12x + 24y^2 \Rightarrow f_{yy} = 48y$

$f_{xy} = -12$ ✓

$f_{yx} = -12$ ✓

REFUTATION!

FEEL THE BURN, MILLS!!!

$f_x = 3x^2 - 12y \overset{\text{SET}}{=} 0$

$\Rightarrow 12y = 3x^2$

$\Rightarrow y = \frac{1}{4}x^2$ Send to f_y :

$-12x + 24\left(\frac{1}{4}x^2\right)^2 = -12x + \frac{24}{16}x^4 = -12x + \frac{3}{2}x^4$

$= \frac{3}{2}x^4 - 12x = \frac{3}{2}x(x^3 - 8) = 0 \Rightarrow x = 0, 2$

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

$x^3 - y^3 = (x-y)(x^2 + xy + y^2)$

$x^3 + y^3 = (x+y)(x^2 - xy + y^2)$

will never have real roots.

$x = 0,\ x = 2$

$\Rightarrow y = \frac{1}{4}(0)^2 = 0 \rightsquigarrow (0,0)$

$y = \frac{1}{4}(2)^2 = 1 \rightsquigarrow (2,1)$

$D = f_{xx}f_{yy} - f_{xx}^2 = (6x)(48y) - (-12)^2$

$D(0,0) = -144 < 0$ MAXIE

$D(2,1) = (6(2)(48(1)) - 144$

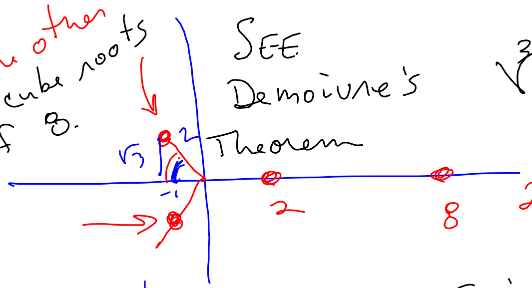
$= 576 - 144 = 432 > 0$ MINNIE

All for Kylie.

The other 2 cube roots of 8.

See Demoivre's Theorem

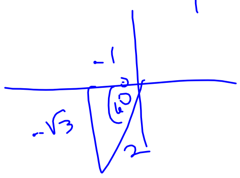
$\sqrt[3]{8}$ = PRINCIPAL CUBE ROOT of 8 = 2



$2\left(\cos\left(\frac{2\pi}{3}\right) + i\sin\left(\frac{2\pi}{3}\right)\right)$

$2\left(\cos\left(\frac{4\pi}{3}\right) + i\sin\left(\frac{4\pi}{3}\right)\right)$

$-1 \pm \sqrt{3}\, i$



$1^2 + \sqrt{3}^2 = 1 + 3 = 4$

$\sqrt{4} = 2$

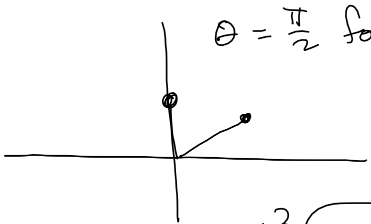
The n n^{th} roots of unity of $\cos\theta + i\sin\theta$ are

$\cos\left(\frac{\theta}{n} + \cancel{\frac{2k\pi}{n}}\right) + i\sin\left(\frac{\theta}{n} + \frac{2k\pi}{n}\right)$, $k = 0, 1, \ldots, n-1$

$k = 0$ is the PRINCIPAL n^{th} root.

$5i$

$\theta = \frac{\pi}{2}$ for $i = \cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$



$\sqrt[3]{i} = \cos\left(\frac{\pi}{6}\right) + i\sin\frac{\pi}{6}$

$\sqrt[3]{5}\left(\boxed{\cos\left(\frac{\pi}{6} + \frac{2\pi}{3}\right) + i\sin\left(\frac{\pi}{6} + \frac{2\pi}{3}\right)}\right)$

$\sqrt[3]{5}\left(\cos\left(\frac{\pi}{6} + \frac{4\pi}{3}\right) + i\sin\left(\frac{\pi}{6} + \frac{4\pi}{3}\right)\right)$