Math 112

Q's

11 Find the inverse function of $f(x) = 9^{-6x+3} - 8$.

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

$y = 9^{-6x+3} - 8$

Find f^{-1} → Swap x, y $\quad x = 9^{-6y+3} - 8$ (Solve for y)

So $x + 8 = 9^{-6y+3}$

$\log_9(x+8) = \cancel{\log_9 9}^{-6y+3}$

$\log_9(x+8) = -6y + 3$

So $y = \dfrac{3 - \log_9(x+8)}{6}$

$$\boxed{y = \frac{1}{2} - \frac{1}{6}\log_9(x+8)}$$

Edfinity Notation:

$\log_b x$ is $\log(b, x)$

$\ln x$ is $\log(e, x)$

$\log_{10} x$ is $\log(10, x)$

$$f(x) = \frac{x^3 - 4x^2 - 4x - 5}{x^2 + x + 1} = x - 5$$

Domain: $(-\infty, \infty)$

No vertical asymptotes

No holes in the graph

Slant asymptote: $y = x - 5$

$f(x) = x - 5$ everywhere.

$f(x) = \dfrac{x^3 - 4x^2 - 4x - 5}{x^2 + x + 1}$

Step 1: Factor

ex $f(x) = \dfrac{x^3-4x^2-4x-5}{x^2+x+1}$

factor x^2+x+1? try quad. formula $(x-r_1)(x-r_2)$

$$r = \frac{-1 \pm \sqrt{1-4}}{2} = \frac{-1 \pm \sqrt{-3}}{2}$$

imaginary!

⇒ no real zeros of denom!

so

- no vertical asym.
- no holes.

⇒ horiz. asym. none. b/c degree of numerator is larger than the degree of denom.

⇒ slant? use long division

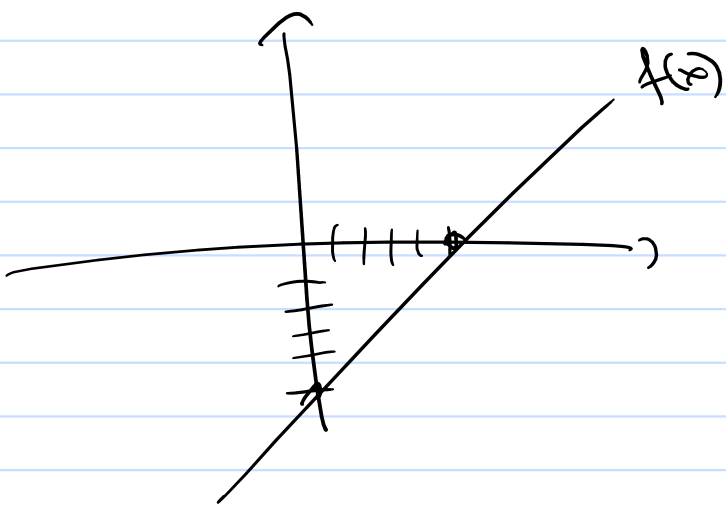
$$\begin{array}{r|l} & x - 5 \\ \hline x^2+x+1 & x^3 - 4x^2 - 4x - 5 \\ & x^3 + x^2 + x \\ \hline & -5x^2 - 5x - 5 \\ & -5x^2 - 5x - 5 \\ \hline & 0 \end{array}$$

so $x^3-4x^2-4x-5 = (x^2+x+1)(x-5)$

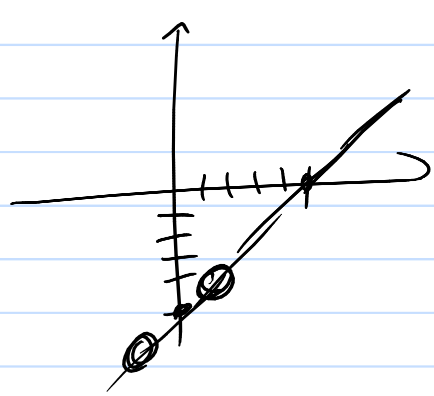
or

$$\frac{x^3-4x^2-4x-5}{x^2+x+1} = \frac{\cancel{(x^2+x+1)}(x-5)}{\cancel{(x^2+x+1)}} = x-5,$$

$x \neq -\frac{1}{2} \pm \frac{\sqrt{3}}{2} i$



$f(x) = \dfrac{\cancel{(x^2-1)}(x-5)}{\cancel{(x^2-1)}} = x-5, \; x \neq \pm 1$



1 Use the Laws of logarithms to rewrite the expression

$\log(MN) = \log(M) + \log(N)$

$\log\left(\frac{M}{N}\right) = \log(M) - \log(N)$

$\log(M^p) = p\log(M)$

$$\log\left(\frac{x^{20} \cdot y^2}{(z^{11})}\right) = \log(x^{20} \cdot y^2) - \log(z^{11})$$

in a form with no logarithm of a product, quotient or power.

After rewriting we have

$$= \log(x^{20}) + \log(y^2) - \log(z^{11})$$

$$\log\left(\frac{x^{20}y^2}{z^{11}}\right) = A\log(x) + B\log(y) + C\log(z)$$

$$20\log(x) + 2\log(y) - 11\log(z)$$

with

$A =$ 20

$B =$ 2

and

$C =$ -11

Domains:

$$\frac{\sqrt{4x+2}}{\sqrt{x^2-4} - 3\log_4(x)}$$

radicals: ① $\sqrt{4x+2}$ so $4x+2 \geq 0$ $\boxed{x \geq -1/2}$

② $\sqrt{x^2-4}$ so $x^2 - 4 \geq 0$

$(x+2)(x-2) \geq 0$

$+$ $-$ $+$

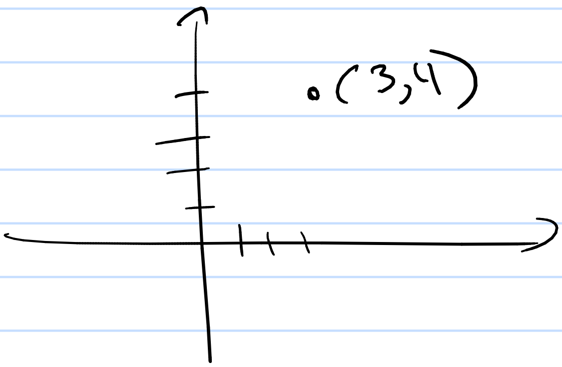
-2 2

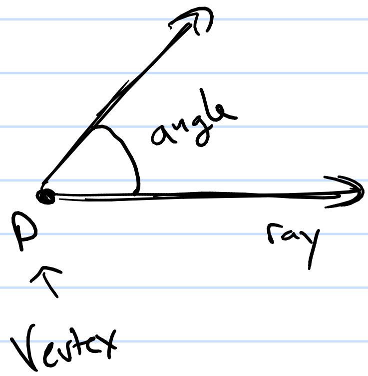
Sign table

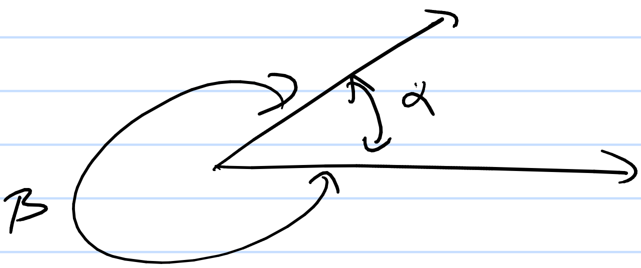
logs $\log_4(x)$ so $\boxed{x > 0}$

Angles

goal: Analyze Geometry with functions

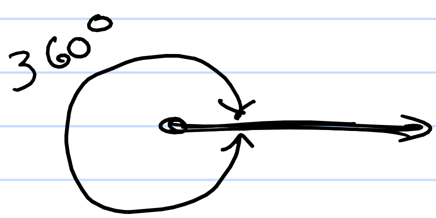






Measure of Angle

① Degrees



$360 = 2^3 3^2 5$