Questions on 1.3 and 1.5 HW?

(13) $f(x)=2x+3$

$x=2y+3$

$-3 \quad -3$

$x-3=2y$

$\frac{x-3}{2}=\frac{2y}{2}$

$\frac{x-3}{2}=y$

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

$f(f^{-1}(x))=f\left(\frac{x-3}{2}\right)=$

$2\left(\frac{x-3}{2}\right)+3=$

$x-3+3=x\checkmark$

$f^{-1}(f(x))=f^{-1}(2x+3)=$

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

(43) $f(x) = \frac{100}{1+2^{-x}}$

$(1+2^{-y})x = \frac{100}{1+2^{-y}} \cdot 1+2^{-y}$

$x(1+2^{-y}) = 100$

$\frac{x(1+2^{-y})}{x} = \frac{100}{x}$

$1+2^{-y} = \left(\frac{100}{x}\right) - 1$

$\log_2 2^{-y} = \log_2\left(\frac{100}{x} - 1\right)$

$-y \cdot \log_2 2 = \log_2\left(\frac{100}{x} - 1\right)$

$-y = \log_2\left(\frac{100}{x} - 1\right)$

$f^{-1}(x) = y = -\log_2\left(\frac{100}{x} - 1\right)$

$f(x) = \frac{100}{1+2^{-x}}$

$f(f^{-1}(x)) = f\left(-\log_2\left(\frac{100}{x} - 1\right)\right) =$

$\frac{100}{1+2^{+\left(1+\log_2\left(\frac{100}{x}-1\right)\right)}} = \frac{100}{1+\frac{100}{x}-1} = \frac{100}{\frac{100}{x}} = x$ ✓

$f^{-1}(f(x)) = f^{-1}\left(\frac{100}{1+2^{-x}}\right) = -\log_2\left(\frac{100}{\frac{100}{1+2^{-x}}} - 1\right) =$

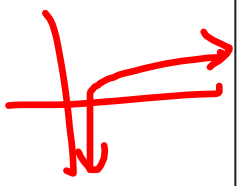
$-\log_2(1+2^{-x}-1) = -\log_2(2^{-x}) =$

$--x\log_2 2 = x$ ✓

Sep 2-9:30 AM

Section 1.3 & 1.5 Exponents & Logarithms

--day 2

Parent Function	Graph	Domain	Range	Even/Odd	Transformations
$\log x$		$(0,\infty)$	$(-\infty,\infty)$	neither	rotate reflect translate dilate

Properties of logarithms: pg 40

base a: $a^{\log_a x} = x$ & $\log_a a^x = x$, $a>1$, $x>0$

base e: $e^{\ln x} = x$ & $\ln e^x = x$, $x>0$

$x>0, y>0$

- product rule: $\log_a(xy) = \log_a x + \log_a y$
- quotient rule: $\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$
- power rule: $\log_a x^y = y \log_a x$

EXAMPLES

Expand $\log\left(\frac{x^2}{(x-1)^3}\right)$ $= \log x^2 - \log(x-1)^3 =$

$2\log x - 3\log(x-1)$

Condense (write as a single logarithm) $\frac{2}{3}\ln 8 - \ln(3^4 - 8)$ $\ln\left(\frac{8^{2/3}}{(3^4-8)}\right) =$

$\ln\left(\frac{4}{73}\right)$

Solve $\log_4(x+3) + \log_4(2-x) = 1$

$4^{\log_4(x+3)(2-x)} = 4^1$

$(x+3)(2-x) = 4$

$2x - x^2 + 6 - 3x = 4$

$-x^2 - x + 6 = 4 \quad +x^2 + x - 6$

$+x^2 \quad +x \quad -6$

$0 = x^2 + x - 2$

$0 = (x+2)(x-1)$

$x = -2, 1$

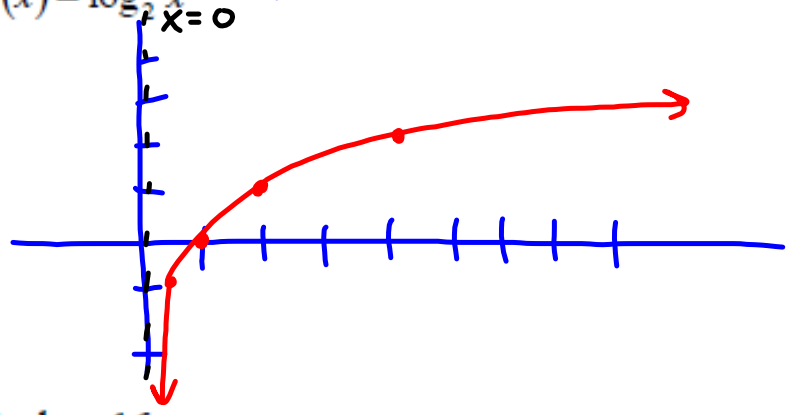
Change of base formulas:

$$\log_a x = \frac{\ln x}{\ln a} = \frac{\log x}{\log a}$$

EXAMPLES

Graph $f(x) = \log_2 x$ $\quad 2^y = x$

x	y
1	0
2	1
4	2
$\frac{1}{2}$	-1



Evaluate $\log_7 16$

$$\frac{\ln 16}{\ln 7} \approx 1.4$$

Using logarithms to solve exponential equations:

EXAMPLES

$\ln e^{0.05t} = \ln 3$ $\log_e e$

$0.05t \ln e = \ln 3$ $\ln e = 1$

$\frac{0.05t}{0.05} = \frac{\ln 3}{0.05}$

$t = 21.97$

Sarah invests $1000 in an account that earns 5.25% compounded annually. How long will it take the account to reach $2500?

$\frac{2500}{1000} = \frac{1000(1+0.0525)^t}{1000}$

$\ln 2.5 = \ln 1.0525^t$

$\frac{\ln 2.5}{\ln 1.0525} = t$

$18 \text{ yrs} \approx$

Using properties of logarithms to solve problems.

Solve for y: $\ln y = 2t + 4$

$e^{\ln y} = e^{2t+4}$

$y = e^{(2t+4)}$

hw

Solve for x: $\frac{5^x - 5^{-x}}{5^x + 5^{-x}} = \frac{1}{8}$

hw

Solve for x: $(\log_3 x)^2 - \log_3 x^2 = 3$

Solve for x: $\log_2(\log_2 x) = 2$

$2^{\log_2(\log_2 x)} = 2^2$

$2^{\log_2 x} = 4$

2^2

$x = 16$

Homework

1.3 pg.26-27 #1-29EOO
1.5 pg.43 #1-15,29-45 odds

Oct 21-8:47 AM

Rational Functions & Factoring

Polynomials:

- many terms

$P(n) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_2 x^2 + a_1 x^1 + a_0$

Factoring a polynomial:

Binomial thm, Pascal's Δ

Rational Root theorem & Long division

Solving/ Finding zeros or roots:

Algebraically: make $y = 0$ & solve for x.

Graphically: y_1 - L side of = } find intersection (make eqn. = 0 & find zeros.)

y - R side of = }

Numerically:

Rational Root theorem & Long division

What if it can't be factored?

Quad formula or calculator

Rational functions:

$\frac{\text{polynomial}}{\text{polynomial}}$

Simplifying rational functions:

We can ONLY simplify FACTORS out of BOTH the numerator & denominator.

Multiplying/dividing: factor first

• - mult. straight across

÷ - mult. first fraction by the reciprocal of second fraction

EXAMPLES: Find the product or quotient.

$$\frac{x^2+11x+30}{x^2+15x+56}\cdot\frac{x^2+4x-32}{3x^2+18x}=$$

$$\frac{(x+5)(x+6)(x+8)(x-4)}{(x+7)(x+8)(3x)(x+6)}$$

$$\frac{(x+5)(x-4)}{3x(x+7)}$$

$$\frac{2x+1}{16x^2}\div\frac{2x^2+5x+2}{4x^3+4x}$$

$$\frac{(2x+1)(4x)(x^2+4)}{(16x^2)}$$

Adding/subtracting:

EXAMPLES: Find the sum or difference.

$$\frac{2}{3x}+\frac{3}{2x^2}$$

$$\frac{3}{x+1}-\frac{2}{x-3}$$

$$\frac{x-2}{x^2+x-12}-\frac{x}{x^2-2x-3}$$

Sep 1-8:50 AM

Simplifying complex fractions:

EXAMPLES: Simplify.

$$\frac{\frac{1}{2}+\frac{2}{x-6}}{\frac{3x-6}{x^2-12x+36}}$$

$$\frac{\frac{x-3}{x^3}-\frac{2}{x^3-x^2}}{\frac{1}{2}-\frac{1}{x^2}}$$

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