Week 9 Tuesday

March 5, 2019 7:54 AM

Quiz $f(x) = 1+\sqrt{x}$ $g(x) = x^2 - 2$

a) $g(f(4))$

$= g(3)$

$= 7$

b) $g(f(x))$

$= g(1+\sqrt{x})$

$= (1+\sqrt{x})^2 - 2$ ✓

or $1 + 2\sqrt{x} + \cancel{\sqrt{x}^2}_{x} - 2$ ✓

or $x + 2\sqrt{x} - 1$ ✓

Expression	$g(f(x))$	Find / Simplify
Equation	$g(f(x)) = 0$	Solve

Test Thurs 7^{th}

Quiz Tues 12^{th} $\boxed{6.4}$

6.4 Cont'd

Ex: Solve and round to 2 decimal places.

a) $200 = 10^x$

$\log_{10} 200 = x$

$$\log 200 = x$$

$\boxed{\log}\ \boxed{2}\boxed{0}\boxed{0}\ \boxed{=}$

$$x \approx 2.30$$

b) $200 = e^{x}$

$$\log_e 200 = x$$

$$\ln 200 = x$$

$\boxed{\ln}\ \boxed{2}\boxed{0}\boxed{0}\ \boxed{=}$

$$x \approx 5.30$$

Ex: Solve for x. Give exact values.

a) $\log_3 (5x+6) = 4$

$$3^4 = 5x+6$$

$$81 = 5x+6$$

$$75 = 5x$$

$$15 = x$$

b) $\log_x 9 = 2$

$$x^2 = 9$$

$$x = \pm 3$$

$\boxed{\text{But base} > 0}$

$$x = 3$$

c) $5e^{7x} = 10$

$$e^{7x} = 2$$

$$\log_e 2 = 7x$$
$$\ln 2 = 7x$$
$$x = \frac{\ln 2}{7}$$

Ex: Simplify

a) $\log(10^8 \cdot 10^{11})$

$= \log 10^{19}$

$= \log_{10} 10^{19}$

$= 19$

b) $3^{\boxed{\log_3 12}}$ $\leftarrow$ exponent that goes on 3 to make 12

$= 12$

Alternatively: 3^x and $\log_3 x$ are inverse functions

$$\log_3 3^{?} = ?$$

$$3^{\log_3 ?} = ?$$

More generally $\log_b b^y = y$

$a^{\log_a P} = P$

$$\log_2 8 = 3 \qquad\qquad 2^{\boxed{3}} = 8$$

$$2^{\boxed{\log_2 8}} = 2^3 = 8$$

$$3^{\log_3 12} = 12$$

6.5 Properties of Logarithms

3 Rules

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

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

$$\log_a M^r = r \log_a M$$ "Power Rule"

Ex: Simplify

a) $\log_2\left(\frac{x^3}{y^4}\right)$

$$= \log_2 x^3 - \log_2 y^4$$

$$= 3\log_2 x - 4\log_2 y$$

b) $$\ln\left(x^5\sqrt{x^3+1}\right)$$

$$= \ln x^5 + \ln (x^3+1)^{1/2}$$

$$= 5\ln x + \frac{1}{2}\ln(x^3+1)$$

c) $$e^{r\ln a}$$

$$= e^{r\log_e a}$$

Power Rule

$$= e^{\log_e a^r}$$

$$= a^r$$