Algebra and Function Review

Name: _____   Section: _____

Fraction Arithmetic

Let $b, e \neq 0$ in the following.

$$\frac{a}{b} + \frac{c}{b} = \frac{a+c}{b} \qquad\qquad \frac{a}{b} - \frac{c}{b} = \frac{a-c}{b}$$

$$\frac{a}{b} \cdot \frac{c}{e} = \frac{a \cdot c}{b \cdot e} \qquad\qquad \frac{1}{\frac{a}{b}} = \frac{b}{a}$$

$$\frac{a}{b} = \frac{a \cdot e}{b \cdot e} \qquad\qquad \frac{a \cdot c}{b} = a \cdot \frac{c}{b}$$

Exponential Arithmetic

Let $a, b > 0$ in the following.

$$a^{r+s} = a^r \cdot a^s \qquad\qquad a^{r-s} = \frac{a^r}{a^s}$$

$$(a^r)^s = a^{r \cdot s} \qquad\qquad a^{-s} = \frac{1}{a^s}$$

$$(a \cdot b)^r = a^r \cdot b^r \qquad\qquad a^s = \frac{1}{a^{-s}}$$

$$\sqrt[r]{a \cdot b} = \sqrt[r]{a} \cdot \sqrt[r]{b} \qquad\qquad \sqrt[r]{a} = a^{1/r}$$

Fractions which do NOT simplify easily

Doesn't simplify at all: $\dfrac{3}{x+1}$

Must find a common denomiator before you can combine terms:

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

Exponents and Products that do NOT simplify easily

Doesn't simplify at all:

$$\sqrt{x+1} = (x+1)^{1/2}$$

You must FOIL to simplify:

$$(x+1)^2 = (x+1)(x+1) = x^2 + 2x + 1$$

You must rewrite, FOIL, *and* distribute twice to simplify:

$$(x+1)^3 = (x+1)(x^2 + 2x + 1) = (x+1) \cdot x^2 + (x+1) \cdot 2x + (x+1) \cdot 1$$

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Graphs of Common Functions

$f(x) = x^2$

$f(x) = x^3$

$f(x) = \sqrt{x}$

$f(x) = \sqrt[3]{x}$

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

$f(x) = \log_2(x)$

$f(x) = \ln(x) = \log_e(x)$

$f(x) = |x|$

$f(x) = \begin{cases} \sqrt[3]{x} & \text{if } x \geq 1 \\ x^2 & \text{if } 1 > x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$

$f(x) = \cos(x)$

$f(x) = \sin(x)$

$f(x) = \dfrac{2}{1 + 5 \cdot 15^{-x}}$