4 $x^5(x^2+3x)^3$

$(a+b)^3$
$= a^3+3a^2b+3ab^2+b^3$

$= x^5(x^6+3x^4(3x)+3x^2(9x^2)+3^3x^3)$

$= x^5(x^6+9x^5+27x^4+27x^3)$

$= x^{11}+9x^{10}+27x^9+27x^8$

$2^3 = 8$

$2^2 = 4$

$2^1 = 2$

$2^0 = 1$

$2^{-1} = \frac{1}{2}$

$2^{-2} = \frac{1}{4}$

$3^3 = 27$

$3^2 = 9$

$3^1 = 3$

$3^0 = 1$

$3^{-1} = \frac{1}{3}$

$3^{-2} = \frac{1}{9}$

$2^{1/2} \cdot 2^{1/2} = 2^1$

$2^{1/2} = \sqrt{2}$

1 $a^0 = 1$ except when $a = 0$

0^0 indeterminant

0

$y = 0^x$ $x \to 0$ $y \to 0$

$y = x^0$ $x \to 0$ $y \to 1$

$y = x^x$ $x \to 0$

10 $\frac{7}{x} + \frac{3}{x^2} = 6$ $x = \frac{1}{y}$

$7x + 3x^2 = 6$

$\rightarrow 7y + 3 = 6y^2$

Fractional Exponents

① in general I will assume $x>0$

② $x^{\frac{a}{b}} = \sqrt[b]{x^a}$

ex $x^{3/2} = \sqrt[2]{x^3}$

ex $64^{1/3} = \sqrt[3]{64} = \sqrt[3]{4^3} = 4$

$(4^3)^{1/3}$

ex $\sqrt[3]{(ab)^2} \cdot \sqrt[5]{a^7(ba)^2}$

$= \left((ab)^2\right)^{1/3} \cdot \left(a^7(ba)^2\right)^{1/5}$

$= a^{2/3}b^{2/3} \cdot a^{7/5}b^{2/5}a^{2/5}$

$= a^{2/3}b^{2/3} \cdot a^{9/5}b^{2/5}$

$= a^{\frac{10}{15}}b^{\frac{10}{15}} \cdot a^{27/15}b^{6/15}$

$= a^{37/15}b^{16/15}$

Warmups

1. $a^{1/2}$, $a^{1/4}$, $a^{1/6}$, when $a<0$

$(-2)^{1/2} = \sqrt{-2} = 2i$ I want to avoid complex #'s.

2. $(ab)^3 = a^3 b^3$ ok

$(a^2+b^2)^{1/2} = a+b$ not ok

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