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Section 6.6
Solving Equations

1) exponent equations with like bases (6.3)

2) exponent equations with unlike bases (6.6)

3) equations with logs

4) quadratic-like equations

Equations with logs

(22) $\log_6(x+4) + \log_6(x+3) = 1$

$\log_6(x+4)(x+3) = 1$

$(x+4)(x+3) = 6^1$

$x^2+7x+12 = 6$

$x^2+7x+6 = 0$

$(x+6)(x+1) = 0$

$x = -6$ $\quad$ $x = -1$

$x = -6$

$\log_6(-6+4) = -2$ = a problem!

Equations with like bases

$x^2 x^3 = x^5$

$2^x \cdot 4^{x+1} = 16^{3x} \rightarrow 2^x \cdot (2^2)^{(x+1)} = (2^4)^{3x} \rightarrow$

$2^x \cdot 2^{2x+2} = 2^{12x} \rightarrow 2^{x+2x+2} = 2^{12x} \rightarrow 2^{3x+2} = 2^{12x}$

$3x+2 = 12x$

$2 = 9x$

$\frac{2}{9} = x$

Exponent equations with unlike bases

$2^x = 3^{x-1}$

$\ln 2^x = \ln 3^{x-1}$

$x \cdot \ln 2 = (x-1) \cdot \ln 3$

$x \ln 2 = x \ln 3 - \ln 3$

$x \ln 2 - x \ln 3 = -\ln 3$

$x(\ln 2 - \ln 3) = -\ln 3$

example: $[x \cdot 5 = 12]$ divide

so, $x = \dfrac{-\ln 3}{\ln 2 - \ln 3}$ or $x = \dfrac{\ln 3}{-\ln 2 + \ln 3} \rightarrow x = \dfrac{\ln 3}{\ln 3 - \ln 2}$

same answer

$\dfrac{-2}{3} = \dfrac{2}{-3}$

Quadratic-like equations

$3^{2x} + 3^{x+1} - 4 = 0$

$(3^x)^2 + 3^x \cdot 3^1 - 4 = 0$

$(3^x)^2 + 3 \cdot 3^x - 4 = 0$

let $y = 3^x$

$\ln 1 = \log_e 1 = 0$

$y^2 + 3y - 4 = 0$

$(y+4)(y-1) = 0$

$y = -4 \quad y = 1 \rightarrow 3^x = -4 \quad 3^x = 1$

ex. $y^2 - 3y + 8 = 0$

$3^x = -4$

$\ln 3^x = \ln(-4)$

$3^x = 1$

$\ln 3^x = \ln 1$

$x \cdot \ln 3 = \ln 1$

$\dfrac{x \cdot \ln 3}{\ln 3} = \dfrac{0}{\ln 3}$

$x = 0$