Section 4.5 – Exponential and Logarithmic Equations

- المعادلة الأسية exponential equation هي معادلة يكون فيها المتغير في الأس ← 5^x

Example 1

Solve the exponential equation.

(b) $5^{2x} = 5^{x+1}$

(b) $3^{x+2} = 7$

Solution

(a) $2x = x + 1$

$2x - x = 1$

$x = 1$

(b) $\ln 3^{x+2} = \ln 7$

$x + 2 \ln 3 = \ln 7$

$x + 2 = \frac{\ln 7}{\ln 3}$

$x = \frac{\ln 7}{\ln 3} - 2$

- المعادلة اللوغاريتمية logarithmic equation هي معادلة المتغير فيها داخل لوغاريتم ← $\log_a x$

Example 2

Solve the equation $\log(x^2 + 1) = \log(x - 2) + \log(x + 3)$

Solution

$\log(x^2 + 1) = \log(x - 2)(x + 3)$

$x^2 + 1 = (x - 2)(x + 3)$

$x^2 + 1 = x^2 + x - 2x - 6$

$x^2 - x^2 - x = -6 - 1$

$-x = -7 \Rightarrow x = 7$

Problems

- Solve the equation.

(a) $5^x = 125$

(b) $10^{2x-1} = \frac{1}{10^{6+5x}}$

(c) $3 + 2e^{3-2x} = 11$

(d) $e^{2x} - e^{x} - 6 = 0$

(e) $3^{2x} - 4(3^x) + 3 = 0$

(f) $3xe^x + x^2e^x = 0$

(g) $\ln x = 8$

(h) $\log_2(25 - x) = 3$

(i) $4 + 3\log(2x) = 16$

(j) $\log_5 x + \log_5(x+2) = \log_5 3$