

§4.5 Exponential and logarithmic equations

(23)

recall exponent rules:

$$a^x a^y = a^{x+y}$$
$$(a^x)^y = a^{xy}$$
$$a^0 = 1$$
$$a^1 = a$$

log rules: $\log_a(xy) = \log_a(x) + \log_a(y)$

$$\log_a\left(\frac{x}{y}\right) = \log_a(x) - \log_a(y)$$

$$\log_a(x^y) = y \log_a(x)$$

$$\log_a(x) = \frac{\log_b(x)}{\log_b(a)}$$

Solve: ① $2e^{3-4x} = 7$

$$e^{3-4x} = 7/2$$

$$\ln(e^{3-4x}) = \ln(7/2)$$

$$3-4x = \ln(7/2)$$

$$3 - \ln(7/2) = 4x$$

$$x = \frac{3 - \ln(7/2)}{4}$$

② $\log_2(x+3) = 12$

$$2^{\log_2(x+3)} = 2^{12}$$

$$x+3 = 2^{12}$$

$$x = 2^{12} - 3$$

③ $\log(x+2) + \log(x-1) = 4$

$$e^{\log((x+2)(x-1))} = e^4$$

$$(x+2)(x-1) = e^4$$

$$x^2 + x - 2 - e^4 = 0$$

(quadratic formula)

④ (quadratic type).

$$e^{2x} - e^x = 46$$

$$(e^x)^2 - e^x - 46 = 0$$

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

$$e^x = 3 \quad e^x = -2$$

$$x = \ln(3) \quad \text{no solns.}$$

⑤ factor of e^x :

$$3xe^x + x^2e^x = 0$$

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

$$e^x x(3+x) = 0$$

$$x = 0, -3$$