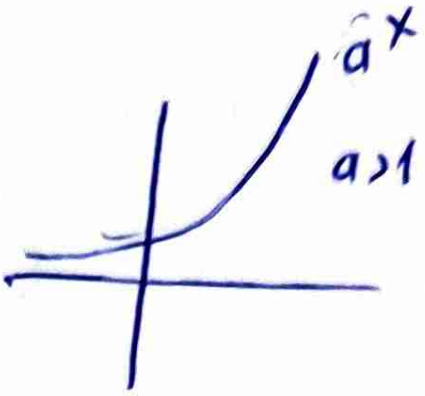
12. (β) $3^x < \frac{1}{9}$

$3^x < \frac{1}{3^2}$

$3^x < 3^{-2}$.

$x < -2$



$x_1 < x_2$

$a^{x_1} < a^{x_2}$

(ε) $5^{x^2} - 1 < 0$

$5^{x^2} < 1$

$5^{x^2} < 5^0$

$x^2 < 0$ Αδύνατη.

(στ) $e^{x^2} \leq \frac{1}{e^x}$

$e^{x^2} \leq e^{-x}$

$x^2 \leq -x$

$x^2 + x \leq 0$

x		-1		0
x^2+x	$+$	$-$	$-$	$+$

$x \in [-1, 0]$.

6. ⑧ $2^{x+1} + 2^{x+2} + 2^{x-1} + 2^{x-2} = 54$

$2^x \cdot 2^1 + 2^x \cdot 2^2 + 2^x \cdot 2^{-1} + 2^x \cdot 2^{-2} = 54$

$2 \cdot 2^x + 4 \cdot 2^x + 2^x \cdot \frac{1}{2} + 2^x \cdot \frac{1}{4} = 54$

$2^x = t$

$2t + 4t + \frac{t}{2} + \frac{t}{4} = 54$

$6t + \frac{t}{2} + \frac{t}{4} = 54$

$24t + 2t + t = 216$

$27t = 216$

$t = 8$

$2^x = 2^3$

$x = 3$

8

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

$$e^{2x} + 3 = \frac{4}{e^{2x}}$$

$e^{2x} = t$

$$t + 3 = \frac{4}{t}$$

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

$t = -4$

$e^{2x} = -4$

Αδύνατη

$t = 1$

$e^{2x} = 1$

$e^{2x} = e^0$

$2x = 0$

$x = 0$

6. ⑧ $2^{x-1} + 2^{x-2} - 2^{x-3} = 10$

$2^x \cdot 2^{-1} + 2^x \cdot 2^{-2} - 2^x \cdot 2^{-3} = 10$

$2^x \frac{1}{2} + 2^x \frac{1}{4} - 2^x \frac{1}{8} = 10$

Әсіп $2^x = t$

$\frac{t}{2} + \frac{t}{4} - \frac{t}{8} = 10$

$4t + 2t - t = 80$

$5t = 80$

$t = 16$

$2^x = 16$

$2^x = 2^4$

$x = 4$

8. ① $e^{3x} + 5e^{2x} = 6e^x$

$(e^x)^3 + 5(e^x)^2 = 6e^x$ $\quad e^x = t$

$t^3 + 5t^2 = 6t$

$t^3 + 5t^2 - 6t = 0$

$t(t^2 + 5t - 6) = 0$

$t = 0$; $t = -6$; $t = 1$

$e^x = 0$ $\quad e^x = -6$ $\quad e^x = 1$

$e^x = e^0$

$x = 0$

Adası $\quad$ Adası

8. (B) $e^{2x} - (1+e)e^x + e = 0$

$(e^x)^2 - (1+e)e^x + e = 0$

$\underline{\underline{e^x = t}}$

$t^2 - (1+e)t + e = 0$

$\Delta = (1+e)^2 - 4e = 1+2e+e^2-4e$

$\Delta = 1-2e+e^2 = (1-e)^2$

$t = \dfrac{1+e \pm 1-e}{2}$ → (1), (e)

$t = 1$

$e^x = 1$

$e^x = e^0$

$x = 0$

$t = e$

$e^x = e^1$

$x = 1$,

5. (δ) $1 - e^{|x|-2} = 0$

$1 = e^{|x|-2}$

$e^0 = e^{|x|-2}$

$0 = |x|-2$

$|x| = 2$

$x = 2$ $\quad$ $x = -2$

8. (α) $e^{2x} + e^x - 2 = 0$

$(e^x)^2 + e^x - 2 = 0$ $\quad$ $e^x = t$

$t^2 + t - 2 = 0$

$t = -2$ $\quad$ $t = 1$

$e^x = -2$ $\quad$ $e^x = 1$

Δεκτ. $\quad$ $x = 0$

Ενότητα 23

3. (ε) $\sqrt{2} = 2 \cdot 2^x$

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

$2^{1/2} = 2^{x+1}$

$\frac{1}{2} = x+1$

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

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

7. (α) $2^{2x} - 3 \cdot 2^x - 4 = 0$

$2^x = t$

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

$t^2 - 3t - 4 = 0$

$t = 4$ $\qquad$ $t = -1$

$2^x = 4$ $\qquad$ $2^x = -1$

$2^x = 2^2$ $\qquad$ Άδικη.

$x = 2$,

13. (b) $e^{-x} < \sqrt{e}$

$$e^{-x} < e^{1/2}$$

$$-x < \frac{1}{2}$$

$$x > -\frac{1}{2}$$

(c) $e^x + 1 > 0$

$$e^x > -1$$

$x \in \mathbb{R}$.

(d) $e^{-x} < e^{2x}$

$$-x < 2x$$

$$0 < 3x$$

$$0 < x$$

14. ⑧ $\left(\frac{3}{4}\right)^x \geq \frac{16}{9}$

$$\left(\frac{3}{4}\right)^x \geq \left(\frac{4}{3}\right)^2$$

$$\left(\frac{3}{4}\right)^x \geq \left(\frac{3}{4}\right)^{-2}$$

$$x \leq -2$$