

PaG 168

49 a) $2^{5x} > 2^{3x+10}$

base = 2 > 1 $\rightarrow 5x > 3x+10$

$5x - 3x > 10$

$2x > 10$

$x > 5$

b) $3^{5-x^2} < 3^{-4}$

base = 3 > 1 $\rightarrow 5-x^2 < -4$

$5-x^2+4 < 0$

$-x^2+9 < 0$

razz: $f(x) = 0 \rightarrow -x^2+9=0$

$-x^2=9 \quad (-1)$

$x^2=9$

$x=\pm\sqrt{9}$

$x=\pm 3$

c) $3^{x-2} > 9$

$3^{x-2} > 3^2$

base = 3 > 1 $\rightarrow x-2 > 2$

$x > 2+2$

$x > 4$

d) $3^{x+1} + 3^{x+2} < 108$

$3^x \cdot 3^1 + 3^x \cdot 3^2 < 108$

$y \cdot 3^1 + y \cdot 3^2 < 108$

$y \cdot 3 + y \cdot 9 < 108$

$12y < 108$

$y < 9$

$x < -3 \quad x > 3$

$3^x < 9$

$3^x < 3^2$

base = 3 > 1

$x < 2$

50 a) $1 < 2^x < 16$

$2^0 < 2^x < 2^4$

base = 2 > 1 $\rightarrow 0 < x < 4$

b) $\frac{1}{2^2} \leq 2^{x-3} \leq \frac{1}{2^1}$

$2^{-2} \leq 2^{x-3} \leq 2^{-1}$

base = 2 > 1 $\rightarrow -2 \leq x-3 \leq -1$

$-2+3 \leq x \leq -1+3$

$1 \leq x \leq 2$

51) $f(x) = 3^{x-1}$; $g(x) = 3^x$ e $R(x) = 4 \rightarrow f(x) + g(x) \geq R(x)$

$3^{x-1} + 3^x \geq 4$

$\frac{3^x}{3^1} + \frac{3^x}{1} \geq 4$

$\frac{3^x}{3} + \frac{3^x}{1} \geq 4$

$\frac{3^x}{3} + \frac{3^x \cdot 3}{1 \cdot 3} \geq 4$

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52 a) $f(x) = \sqrt{2^x - 16}$

$2^x - 16 \geq 0$

$2^x \geq 0 + 16$

$2^x \geq 2^4$

base = 2 > 1

$x \geq 4$

$D = \{x \in \mathbb{R} / x \geq 4\}$

b) $f(x) = \sqrt{7^x - 7^{2x}}$

$7^x - 7^{2x} \geq 0$

$7^x \cdot 7^0 - 7^x \cdot 7^x \geq 0$

$7^x \geq 0 + 7^{2x}$

$x^2 \geq 2x$

$f(x) = x^2 - 2x$

razz: $f(x) = 0$

$x^2 - 2x = 0$

$x(x-2) = 0$

$x=0$ ou $x=2$

base = 7 > 1 $\rightarrow x^2 \geq 2x$

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41 c) $5^{x^2-2x} = 125$
 $5^{x^2-2x} = 5^3$

d) $10^{1-x} = \frac{1}{10}$

$x^2 - 2x = 3 = 0$

$10^{1-x} = 10^{-1}$

$a=1/b=-2/c=-3$

$1-x = -1$

$-x = -2$

$S=2 \quad X=-1$

$X=2$

$P=-3 \quad X=3$

2) $2^{4x-x^2} = 8$

$\Delta = 4^2 - 4(-1)(-3)$

$2^{4x-x^2} = 2^3$

$\Delta = 4$

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

$X = \frac{-4 \pm \sqrt{4}}{2(-1)}$

$a=-1/b=4/c=-3$

$X = \frac{-4 \pm 2}{-2} \rightarrow X_1 = 1$

$X = \frac{-4 \pm 2}{-2} \rightarrow X_2 = 3$

3) $3^{x-5} = 27^{1-x}$

$3^{x-5} = (3^3)^{1-x}$

$3^{x-5} = 3^{3-3x}$

$x - 5 = 3 - 3x$

$4x = 8$

$x = 2$

43 b) $2^{x+3} + 2^{x+1} + 2^x = 88$

$2^x \cdot 2^3 + 2^x \cdot 2^1 + 2^x = 88$

$8 \cdot 2^x + 2 \cdot 2^x + 1 \cdot 2^x = 88$

$11 \cdot 2^x = 88$

$2^x = 8$

$2^x = 2^3 \rightarrow x = 3$

c) $7^x + 7^{x-1} = 8$

$7^x + 7^x = 8$

$7^x + 7^x = 8$

$7^x \cdot 7 + 7^x = 8 \cdot 7$

$7 \cdot 7^x + 7^x = 56$

$7 \cdot 7^x + 1 \cdot 7^x = 56$

$8 \cdot 7^x = 56$

$7^x = 7$

$x = 1$

d) $4 \cdot 2^x + 2^{x-1} = 72$

$4 \cdot 2^x + 2^x = 72$

$4 \cdot 2^x + 2^x = 72$

$8 \cdot 2^x + 1 \cdot 2^x = 144$

$9 \cdot 2^x = 144$

$2^x = 16$

$2^x = 2^4$

$x = 4$

44 a) $3^{2x} + 2 \cdot 3^x - 15 = 0$

$(3^x)^2 + 2 \cdot 3^x - 15 = 0$

$y^2 + 2y - 15 = 0$

$a=1/b=2/c=-15$

$S=-2 \quad X=3$

$P=-15 \quad X=-5$

$y_1=3$

$y_2=-5$

$3^x=3$

$3^x=-5$ não

$3^x=3^1$

$x=1$

b) $4^x - 9 \cdot 2^x + 8 = 0$

$(2^x)^2 - 9 \cdot 2^x + 8 = 0$

$y^2 - 9y + 8 = 0$

$a=1/b=-9/c=8$

$S=9 \quad X=1$

$P=8 \quad X=8$

$y_1=1 \quad y_2=8$

$2^x=1 \quad 2^x=8$

$x=0 \quad x=3$

c) $9^x - 4 \cdot 3^x + 3 = 0$
 $(3^x)^2 - 4 \cdot 3^x + 3 = 0$
 $a = 1, b = -4, c = 3$
 $S = 4, X = 1$
 $P = 3, X = 3$

$y_1 = 1, y_2 = 3$
 $3^x = 3^0, 3^x = 3^1$
 $x = 0, x = 1$

45) $f(x) = \left(\frac{4}{5}\right)^{4x^2 - x}, g(x) = (0,8)^{3(x+1)}$
 $f(a) = g(a)$
 $\Delta = (-4)^2 - 4 \cdot 4 \cdot (-3)$
 $\Delta = 64$
 $\left(\frac{4}{5}\right)^{4a^2 - a} = (0,8)^{3(a+1)}$
 $(0,8)^{4a^2 - a} = (0,8)^{3(a+1)}$
 $4a^2 - a = 3(a+1)$
 $4a^2 - a = 3a + 3$
 $4a^2 - 4a - 3 = 0$
 $a = 4/b = -4/c = -3$

$\frac{-(-4) \pm \sqrt{64}}{2 \cdot 4}$
 $\frac{4 \pm 8}{8}$
 $x_1 = \frac{3}{2}$
 $x_2 = \frac{-1}{2}$ (84)

46) $3^{x+y} = 1$
 $3^{x+y} = 3^0$

$x + y = 0$
 $x = -y$
 $x = -1$

$2^{x+2y} = 2$
 $2^{x+2y} = 2^1$
 $x + 2y = 1$
 $-y + 2y = 1$
 $y = 1$

$x - y = -1 - 1 = -2$

47) $4^x \cdot 8^y = \frac{1}{4}$
 $(9^x \cdot 27^{2y} = 3)$

$4^x \cdot 8^y = 1$
 $(2^2)^x \cdot (2^3)^y = 1$
 $2^{2x+3y} = 2^{-2}$
 $2x + 3y = -2$
 $2x = -2 - 3y$
 $2x = -2 - 3 \cdot 1$
 $2x = -5 \rightarrow x = \frac{-5}{2}$

$9^x \cdot 27^{2y} = 3$
 $(3^2)^x \cdot (3^3)^{2y} = 3$
 $3^{2x} \cdot 3^{12y} = 3$
 $3^{2x+6y} = 3^1$
 $2x + 6y = 1$
 $-2 - 3y + 6y = 1$
 $-3y + 6y = 1 + 2$
 $3y = 3 \rightarrow y = \frac{3}{3} = 1$ (84)

48) $f(x) = 4^{x-1} \rightarrow y = 4^{x-1}$ i) $g(x) = 2 \rightarrow y = 2$ ii)

$y = 4^{x-1}$
 $2 = 4^{x-1}$
 $2 = (2^2)^{x-1}$
 $2 = 2^{2x-2}$
 $1 = 2x - 2$
 $1 + 2 = 2x$
 $3 = 2x$
 $\frac{3}{2} = x$
 $x = \frac{3}{2}$