

169

$$10^{2-2x} = 2 \cdot 10^{-x}$$

1/2

$$(\bullet) \frac{10^{2-2x}}{10^{-x}} = 2$$

$$10^{2-x} = 2 \quad 2-x = \log_{10} 2$$

$$\star x = \log_{10} 2 - 2$$

$$(\bullet) \frac{10^{\cancel{2}} \cdot 10^{-2x}}{10^{\cancel{2}} \cdot 10^{-x}} = \frac{2 \cdot 10^{\cancel{2}}}{10^{\cancel{2}} \cdot 10^{-x}} \quad x = -\log_2 2 + 2$$

$$\frac{10^{-2x}}{10^{-x}} = \frac{2}{10^2}$$

$$10^{-2x+x} = \frac{2}{100}$$

$$10^{-x} = \frac{2}{100}$$

$$-x = \log \frac{2}{100} \quad x = -\log \frac{2}{100}$$

$$(\bullet) 10^{2-2x} = 2 \cdot 10^{-x}$$

$$\frac{10^2}{10^{2x}} = \frac{2}{10^x}$$

$$10^x = t$$

$$\frac{10^2}{t^2} = \frac{2}{t}$$

$$\frac{2t - 10^2}{t} = 0$$

$$t = \frac{100}{2}$$

$$10^x = \frac{100}{2}$$

$$x = \log \frac{100}{2}$$

71

$$12^{2+x} = 4^{2x}$$

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

$$12^2 \cdot 12^x = 4^{2x}$$

$$4^{x+x} = 4^x \cdot 2^{2x}$$

$$144 \cdot 12^x = 4^{2x}$$

$$144 = \frac{4^{2x}}{12^x}$$

$$144 = \frac{4^x \cdot 2^{2x}}{3^x \cdot 2^{2x}}$$

$$144 = \left(\frac{4}{3}\right)^x$$

$$(4 \cdot 3)^x = (2^2 \cdot 3)^x = 2^{2x} \cdot 3^x \quad x = \log_{\frac{4}{3}} 144$$

$$(\bullet) 12^{2+x} = 4^{2x}$$

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

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

$$2^{4+2x} \cdot 3^{2+x} = 2^{4x}$$

$$\frac{2^4 \cdot \cancel{2^{2x}} \cdot 3^2 \cdot \cancel{3^x}}{\cancel{2^{2x}} \cdot \cancel{3^x}} = \frac{2^{4x}}{2^{2x} \cdot 3^x}$$

$$2^4 \cdot 3^2 = \frac{2^{4x-2x}}{3^x}$$

$$4^x = (2^2)^x$$

$$\frac{2^{2x}}{3^x} = 144$$

$$\frac{4^x}{3^x} = 144$$

$$\left(\frac{4}{3}\right)^x = 144$$

$$x = \log_{\frac{4}{3}} 144$$

76

$$3^{x+1} + 3^{x-2} - \frac{247}{3^{x-2}} = \frac{15}{3^{x-4}}$$

$$3^{x+1} + 3^{x-2} - \frac{247}{3^x \cdot 3^{-2}} = \frac{15}{3^x \cdot 3^{-1}}$$

$$\frac{(3^x \cdot 3)(3^x \cdot 3^{-2} \cdot 3^{-1}) + (3^x \cdot 3^{-2})(3^x \cdot 3^{-2} \cdot 3^{-1}) - (247)(3^{-1})}{3^x \cdot 3^{-2} \cdot 3^{-1}} = \frac{15 \cdot 3^{-1}}{3^x \cdot 3^{-2} \cdot 3^{-1}}$$

$$3^{2x} \cdot 3^{-2} + 3^{2x} \cdot 3^{-5} - \frac{247}{3} = \frac{5}{3}$$

$$3^{2x} = t$$

$$t \cdot \frac{1}{9} + \frac{1}{243} t - \frac{252}{3} = 0$$

$$\frac{28}{243} t = 84$$

$$t = \frac{84 \cdot 243}{28}$$

$$t = 3 \cdot 243 \quad t = 729$$

$$3^{2x} = 729$$

$$3^{2x} = 3^6$$

$$2x = 6$$

$$x = 3$$