

$$a. 3^{x+1} - 3^{x+2} - 3^x = 63$$

$$(3 - 3^2 - 1) \cdot 3^x = -63$$

$$(3 - 9 - 1) \cdot 3^x = -63$$

$$-7 \cdot 3^x = -63$$

$$3^x = \frac{-63}{-7}$$

$$3^x = 9$$

$$3^x = 3^2$$

$$x = 2$$

$$c. \frac{\left(\frac{1}{2}\right)^{x-1}}{2} - 5 \cdot 2^{-x} = -128$$

$$\frac{1}{2^{x-1}} - 5 \cdot \frac{1}{2^x} = -128$$

$$\frac{1}{2^x} - \frac{5}{2^x} = -128$$

$$-\frac{4}{2^x} = -128$$

$$-\frac{1}{2^{x-2}} = -128$$

$$128 \cdot 2^{x-2} = 1$$

$$2^7 \cdot 2^{x-2} = 1$$

$$2^{x+5} = 1$$

$$2^{x+5} = 2^0$$

$$x+5=0$$

$$x = -5$$

$$e. \left(\frac{3}{2}\right)^{x+2} + \left(\frac{2}{3}\right)^{1-x} - 2 \cdot \left(\frac{3}{2}\right)^x = \frac{11}{27}$$

$$\left(\frac{3}{2}\right)^x \cdot \left(\frac{3}{2}\right)^2 + \frac{2}{3} \left(\frac{2}{3}\right)^{-x} - 2 \left(\frac{3}{2}\right)^x = \frac{11}{27}$$

$$\left(\frac{2}{3}\right)^{-x} \cdot \frac{9}{4} + \frac{2}{3} \cdot \frac{1}{\left(\frac{2}{3}\right)^x} - 2 \cdot \frac{1}{\left(\frac{2}{3}\right)^x} = \frac{11}{27}$$

$$\frac{1}{\left(\frac{2}{3}\right)^x} \cdot \frac{9}{4} + \frac{2}{3} \cdot \frac{1}{\left(\frac{2}{3}\right)^x} - 2 \cdot \frac{1}{\left(\frac{2}{3}\right)^x} = \frac{11}{27}$$

$$j \cdot \frac{9}{4} + \frac{2}{3} \cdot j - 2 \cdot j = \frac{11}{27}$$

$$\frac{9}{4}j + \frac{2}{3}j - 2j = \frac{11}{27}$$

$$243j + 72j - 216j = 44$$

$$99j = 44$$

$$j = \frac{4}{9}$$

$$b. 3 \cdot 3^{x+2} - 2 \cdot 3^x = \frac{25}{9}$$

$$3^{x+3} - 2 \cdot 3^x = \frac{25}{9}$$

$$(3^3 - 2) \cdot 3^x = \frac{25}{9}$$

$$(27 - 2) \cdot 3^x = \frac{25}{9}$$

$$25 \cdot 3^x = \frac{25}{9}$$

$$3^x = \frac{1}{9}$$

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

$$x = -2$$

$$d. 7^{x+1} + \left(\frac{1}{7}\right)^{-x+2} - 3 \cdot 7^x = \frac{53}{49}$$

$$7^{x+1} + 7^{x+2} - 3 \cdot 7^x = \frac{53}{49}$$

$$7 \cdot 7^x + \frac{7^x}{49} - 3 \cdot 7^x = \frac{53}{49}$$

$$\left(7 - 3 + \frac{1}{49}\right) \cdot 7^x = \frac{53}{49}$$

$$\left(4 + \frac{1}{49}\right) \cdot 7^x = \frac{53}{49}$$

$$\left(\frac{196}{49} + \frac{1}{49}\right) \cdot 7^x = \frac{53}{49}$$

$$\frac{197}{49} \cdot 7^x = \frac{53}{49}$$

$$197 \cdot 7^x = 53$$

$$7^x = \frac{53}{197}$$

$$x = \log_7 \left(\frac{53}{197} \right)$$

$$\frac{1}{\left(\frac{2}{3}\right)^x} = \frac{4}{9}$$

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

$$-x = 2$$

$$x = -2$$

$$f - \frac{3^{2x+1}}{3^{x-2}} - 17 \cdot 3^x = 30$$

$$3^{x+3} - 17 \cdot 3^x = 30$$

$$(3^3 - 17) \cdot 3^x = 30$$

$$(27 - 17) \cdot 3^x = 30$$

$$10 \cdot 3^x = 30$$

$$30^x = 30$$

$$3^x = 3^1$$

$$x = 1$$

$$g - \frac{3^x \cdot 31 - 1}{2^2} = \frac{1}{2^7}$$

$$\frac{2^2 \cdot 3^x \cdot 31 - 1}{2^2} = 2^2 \cdot \frac{1}{2^7}$$

$$3^x \cdot 31 - 1 = \frac{2^2}{2^7}$$

$$3^x \cdot 31 - 1 = \frac{4}{2^7}$$

$$31 \cdot 3^x = \frac{4}{2^7} + 1$$

$$31 \cdot 3^x = \frac{31}{2^7}$$

$$3^x = \frac{1}{2^7}$$

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

$$x = -3$$

$$h - 7^{x+1} + 7^x - 8 = 0$$

$$7^{x+1} + 7^x = 8$$

$$(7+1) \cdot 7^x = 8$$

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

$$7^x = 1$$

$$7^x = 7^0$$

$$x = 0$$

$$i - 5^{x+1} - 5^x + 5^{x+2} = \frac{29}{625}$$

$$(5 - 1 + 5^2) \cdot 5^x = \frac{29}{625}$$

$$(5 - 1 + 25) \cdot 5^x = \frac{29}{625}$$

$$29 \cdot 5^x = \frac{29}{625}$$

$$5^x = \frac{1}{625}$$

$$5^x = 5^{-4}$$

$$x = 4$$

$$j - 10^x + 10^{x+1} - 110 = 0$$

$$10^x + 10^{x+1} = 110$$

$$(10+1) \cdot 10^x = 110$$

$$11 \cdot 10^x = 110$$

$$110^x = 110^1$$

$$x = 1$$