Pg 4 Unit 5

(1) $5^3 = 5^{2x-1}$

$3 = 2x - 1$

$+1 \quad +1$

$4 = 2x$

$x = 2$

(2) $9^x = 3^{x+4}$

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

$2x = x + 4$

$x = 4$

(3) $5^{x-1} = 125^{2x+3}$

$5^{x-1} = (5^3)^{2x+3}$

$x - 1 = 6x + 9$

$-10 = 5x$

$x = -2$

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

$2^{3x-1} = (2^2)^{x+2}$

$3x - 1 = 2x + 4$

$x = 5$

(5) $8^{2x-2} = 4^{2-x}$

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

$6x - 6 = 4 - 2x$

$8x = 10$

$x = \frac{5}{4}$

(6) $\frac{1}{3}^{x-3} = 3^{x-1}$

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

$-x + 3 = x - 1$

$4 = 2x$

$x = 2$

(7) $7^{2x+4} = \frac{1}{49}^{x-3}$

$7^{2x+4} = (7^{-2})^{x-3}$

$2x + 4 = -2x + 6$

$4x = 2$

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

(8) $125^{x+3} = \frac{1}{25}^{3x-6}$

$(5^3)^{x+3} = (5^{-2})^{3x-6}$

$3x + 9 = -6x + 12$

$9x = 3$

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

(9) $\left(\frac{1}{32}\right)^{x+3} = \left(\frac{1}{8}\right)^{x-3}$

$(2^{-5})^{x+3} = (2^{-3})^{x-3}$

$-5x - 15 = -3x + 9$

$-24 = 2x$

$x = -12$

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

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

$6x + 3 = -x + 4$

$7x = 1$

$x = \frac{1}{7}$

(11) $4^x = 2^{x+3}$

$(2^2)^x = 2^{x+3}$

$2x = x + 3$

$x = 3$

(12) $5^{3x-1} = 25^{x+4}$

$5^{3x-1} = (5^2)^{x+4}$

$3x - 1 = 2x + 8$

$x = 9$

(13) $3^{x-1} = 27^{2x+3}$

$3^{x-1} = (3^3)^{2x+3}$

$x - 1 = 6x + 9$

$-10 = 5x$

$x = -2$

(14) $125^{2x-2} = 25^{3-x}$

$(5^3)^{2x-2} = (5^2)^{3-x}$

$6x - 6 = 6 - 2x$

$8x = 12$

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

(15) $\frac{1}{6}^{x-3} = 6^{x-1}$

$(6^{-1})^{x-3} = 6^{x-1}$

$-x + 3 = x - 1$

$4 = 2x$

$x = 2$

(16) $10^{2x+4} = \frac{1}{100}^{x-3}$

$10^{2x+4} = (10^{-2})^{x-3}$

$2x + 4 = -2x + 6$

$4x = 2$

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

(17) $8^{x+3} = \frac{1}{4}^{3x-6}$

$(2^3)^{x+3} = (2^{-2})^{3x-6}$

$3x + 9 = -6x + 12$

$9x = 3$

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

(18) $\frac{1}{32}^{x+2} = \frac{1}{8}^{x-4}$

$(2^{-5})^{x+2} = (2^{-3})^{x-4}$

$-5x - 10 = -3x + 12$

$-22 = 2x$

$x = \frac{-22}{2} = -11$

(19) $4^{3x+1} = \frac{1}{2}^{x-5}$

$(2^2)^{3x+1} = (2^{-1})^{x-5}$

$6x + 2 = -x + 5$

$7x = 3$

$x = \frac{3}{7}$

(20) $10^{x-1} = 100^{4-x}$

$10^{x-1} = (10^2)^{4-x}$

$x - 1 = 8 - 2x$

$3x = 9$

$x = 3$

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(21) $6^{x+1} = 36^{x-1}$

$6^{x+1} = (6^2)^{x-1}$

$x+1 = 2x-2$

$x = 3$

(22) $10^{x-1} = 100^{4-x}$

$10^{x-1} = (10^2)^{4-x}$

$x-1 = 8-2x$

$3x = 9$

$x = 3$

(23) $3^x = \frac{1}{27}$

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

$x = -3$

(24) $5^x = \sqrt{125}$

$5^x = 5^{3/2}$

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

(25) $8^{2+x} = 2$

$(2^3)^{2+x} = 2^1$

$6+3x = 1$

$3x = -6$

$x = -2$

(26) $4^{1-x} = 8$

$(2^2)^{1-x} = 2^3$

$2-2x = 3$

$-2x = 1$

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

(27) $27^{2x-1} = 3$

$(3^3)^{2x-1} = 3^1$

$6x-3 = 1$

$6x = 4$

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

(28) $49^{x-2} = 7 \cdot 7^{\frac{1}{2}}$

$(7^2)^{x-2} = 7^{\frac{3}{2}}$

$2x-4 = 1.5$

$2x = 5.5$

$x = \frac{11}{4}$

Simplify

(1) $(3^\pi)^{\frac{2}{\pi}}$

3^2

9

(2) $(4^0)^\pi$

1^π

1

(3) $(2^{\sqrt{2}})^{\sqrt{8}}$

$2^{\sqrt{16}}$

2^4

16

(4) $(5^{2\sqrt{2}})^{\sqrt{2}}$

$5^{2\sqrt{4}}$

5^4

625

(5) $(3^{2+\sqrt{3}})^{2-\sqrt{3}}$

3^{4-3}

3^1

(6) $(5^{1+\sqrt{2}})^{1-\sqrt{2}}$

5^{1-2}

5^{-1}

$\frac{1}{5}$

(7) $3^{2+\sqrt{3}} \cdot 3^{2-\sqrt{3}}$

3^4

81

(8) $5^{1+\sqrt{2}} \cdot 5^{1-\sqrt{2}}$

5^2

25

(9) $2^{\sqrt{5}+1} \div 2^{\sqrt{5}-1}$

$2^{(\sqrt{5}+1)-(\sqrt{5}-1)}$

2^2

4

(10) $\left(3^{1+\sqrt{2}} \div 3^{1-\sqrt{2}}\right)^{\sqrt{2}}$

$\left(3^{(1+\sqrt{2})-(1-\sqrt{2})}\right)^{\sqrt{2}}$

$(3^{2\sqrt{2}})^{\sqrt{2}}$

$3^{2\sqrt{4}}$

$3^4 = 81$

(11) $\left(a^{\sqrt{2}} b^{\sqrt{8}}\right)^{\sqrt{2}}$

$a^{\sqrt{4}} b^{\sqrt{16}}$

$a^2 b^4$

(12) $\left(x^{\sqrt{3}} y^{-\sqrt{3}}\right)^{\sqrt{3}}$

$x^{\sqrt{9}} y^{-\sqrt{9}}$

$\frac{x^3}{y^3}$