**Solve each equation below**

$\log_4 \frac{x^2}{4} = \log_x 64$

$2\log_4 x - 1 = 3\log_x 4$

$2(\log_4 x)^2 - \log_4 x - 3 = 0$

$\log_4 x = -1$, or $\frac{3}{2}$ $\therefore x = \frac{1}{4}$, or $8$

$\log_6 6x = \log_x 36$

$1 + \log_6 x = 2\log_x 6$

$(\log_6 x)^2 + \log_6 x - 2 = 0$

$\log_6 x = -2$, or $1$ $\therefore x = \frac{1}{36}$, or $6$

$x^{\log_4 x^2} = 4x$

$(\log_2 x)^2 = 2 + \log_2 x$

$\log_2 x = -1$, or $2$

$\therefore x = \frac{1}{2}$, or $4$

$\log_7 \frac{x^3}{49} = \log_x 7$

$3\log_7 x - 2 = \log_x 7$

$3(\log_7 x)^2 - 2\log_7 x - 1 = 0$

$\log_7 x = 1$, or $-\frac{1}{3}$ $x = 7$, or $\frac{1}{\sqrt[3]{7}}$

$x^{\log_2 x} = \frac{4}{x}$

$(\log_2 x)^2 = 2 - \log_2 x$

$\log_2 x = -2$, or $1$

$x = \frac{1}{4}$, or $2$

$\log_5 \frac{x}{25} = \log_x 125$

$\log_5 x - 2 = 3\log_x 5$

$\log_5 x = -1$, or $3$

$x = \frac{1}{5}$, or $125$

$\log_3 9x = \log_x 27$

$2 + \log_3 x = 3\log_x 3$

$\log_3 x = 1$, or $-3$

$x = 3$, or $\frac{1}{27}$

$x^{\log_8 x} = \frac{1}{262144x^2}$ $\frac{262144}{x}$

$8 \mid 262144$

$8 \mid 32768$

$4096 = 2^{12}$

$\therefore 2^{18} = 8^6$

$(\log_8 x)^2 = -\log_8 x + 6$

$\log_8 x = 2$, or $-3$

$x = 64$, or $\frac{1}{512}$

$\log_2 \frac{x^2}{2} = \log_x 2$

$2\log_2 x - 1 = \log_x 2$

$\log_2 x = 1$, or $-\frac{1}{2}$

$x = 2$, or $\frac{\sqrt{2}}{2}$

$x^{\log_7 x^3} = \frac{49}{x}$

$3(\log_7 x)^2 = 2 - \log_7 x$

$\log_7 x = -1$, or $\frac{2}{3}$

$x = \frac{1}{7}$, or $\sqrt[3]{49}$

$x^{\log_4 x^2} = \frac{x^3}{4}$

$(\log_2 x)^2 = 3\log_2 x - 2$

$\log_2 x = 1$, or $2$

$x = 2$, or $4$

$x^{\log_5 x} = 25x$

$(\log_5 x)^2 = 2 + \log_5 x$

$\log_5 x = 2$ or $-1$

$x = 25$, or $\frac{1}{5}$

$x^{\log_9 x} = \frac{1}{81x^3}$

$(\log_9 x)^2 = -2 - 3\log_9 x$

$\log_9 x = -1$ , or $-2$

$x = \frac{1}{9}$ or $\frac{1}{81}$

$\log_5 25x^3 = \log_x 5$

$2 + 3\log_5 x = \log_x 5$

$\log_5 x = -1$ , or $\frac{1}{3}$

$x = \frac{1}{5}$ , $\sqrt[3]{5}$

$\log_4 4x^2 = \log_x 64$

$1 + 2\log_4 x = 3\log_x 4$

$\log_4 x = 1$ , or $-\frac{3}{2}$

$x = 4$ , or $\frac{1}{8}$

$\log_9 \frac{x}{729} = \log \frac{1}{x-9}$ $\log_x \frac{1}{81}$

$\log_9 x - 3 = -2\log_x 9$

$\log_9 x = 1$ , or $2$

$x = 9$ , or $81$

$x^{\log_5 x} = \frac{1}{25x^3}$

$(\log_5 x)^2 = -2 - 3\log_5 x$

$\log_5 x = -1$, or $-2$

$x = \frac{1}{5}$, or $\frac{1}{25}$

$\log_3 27x = \log_{\frac{1}{3}} \log_x \frac{1}{9}$

$3 + \log_3 x = -2\log_x 3$

$\log_3 x = -1$, or $-2$

$x = \frac{1}{3}$, or $\frac{1}{9}$

$x^{\log_4 x^3} = \frac{x^2}{4}$ $4x^2$

$3(\log_4 x)^2 = 2\log_4 x + 1$

$\log_4 x = 1$, or $-\frac{1}{3}$

$x = 4$, or $\frac{1}{\sqrt[3]{4}}$

$x^{\log_2 x^3} = \frac{x}{4}$ $4x$

$3(\log_2 x)^2 = \log_2 x + 2$

$\log_2 x = 1$, or $-\frac{2}{3}$

$x = 2$, or $\frac{1}{\sqrt[3]{4}}$

$x^{\log_2 x^3} = 2x^2$

$3(\log_2 x)^2 = 1 + 2\log_2 x$

$\log_2 x = 1$, or $-\frac{1}{3}$

$x = 2$, or $\frac{1}{\sqrt[3]{2}}$

$x^{\log_5 x^2} = \cancel{3x}\ 5x$

$2(\log_5 x)^2 = 1 + \log_5 x$

$\log_5 x = 1$, or $-\frac{1}{2}$

$x = 5$, or $\frac{\sqrt{5}}{5}$

$\log_3 3x^3 = \log_x 9$

$1 + 3\log_3 x = 2\log_x 3$

$\log_3 x = -1$, or $\frac{2}{3}$

$x = \frac{1}{3}$, or $\sqrt[3]{9}$

$\log_6 6x^2 = \log_x 6$

$1 + 2\log_6 x = \log_x 6$

$\log_6 x = -1$, or $\frac{1}{2}$

$x = \frac{1}{6}$ or $\sqrt{6}$

$\log_9 729x = \log_x \frac{1}{81}$

$3 + \log_9 x = -2\log_x 9$

$\log_9 x = -1$, or $-2$

$x = \frac{1}{9}$, or $\frac{1}{81}$

$\log_8 \frac{x}{512} = \log_x \frac{1}{64}$

$\log_8 x - 3 = -2\log_x 8$

$\log_8 x = 1$, or $2$

$x = 8$, or $64$

$x^{\log_8 x} = \frac{x}{512}$ $512x^2$

$(\log_8 x)^2 = 2\log_8 x + 3$

$\log_8 x = -1$, or $3$

$\therefore \quad x = \frac{1}{8}$, or $512$

$x^{\log_4 x^2} = \frac{1}{4x^3}$

$(\log_2 x)^2 = -3\log_2 x - 2$

$\log_2 x = -1$, or $-2$

$x = \frac{1}{2}$, or $\frac{1}{4}$

$\log_7 \frac{x}{7} = \log_x 49$

$\log_7 x - 1 = 2\log_x 7$

$\log_7 x = -1$ , or $2$

$x = \frac{1}{7}$ , or $49$

$\log_8 \frac{x^3}{8} = \log_x 64$

$3\log_8 x - 1 = 2\log_x 8$

$\log_8 x = 1$ , or $-\frac{2}{3}$

$x^{\log_6 x^2} = \frac{216}{x}$

$2(\log_6 x)^2 = 3 - \log_6 x$

$\log_6 x = 1$ , or $-\frac{3}{2}$

$x = 6$ , or $\frac{\sqrt{6}}{36}$

$x^{\log_5 x^2} = \frac{5}{x}$

$2(\log_5 x)^2 = 1 - \log_5 x$

$\log_5 x = -1$ , or $\frac{1}{2}$

$x = \frac{1}{5}$ , or $\sqrt{5}$