

Solving Exponential Equations with and w/o logs

Date _____

Period _____

Solve each equation.

1) $25^{-3n+2} = 125$

Without In

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

$$2(-3n+2) = 3$$

$$-6n+4=3$$

$$\frac{-6n-1}{-6-6}$$

$$n = \frac{1}{6}$$

With In

$$\ln(25^{-3n+2}) = \ln(125)$$

$$\frac{(-3n+2) \ln(25)}{\ln(25)} = \frac{\ln(125)}{\ln(25)}$$

$$-3n+2 = 1.5$$

$$\frac{-3n-2}{-2-2}$$

$$-3n = -0.5$$

$$n = 1.6 \text{ or } \frac{1}{6}$$

2) $4^{2x} = 64$

Without In

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

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

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

With In

$$\ln(4^{2x}) = \ln(64)$$

$$\frac{2x \ln(4)}{\ln(4)} = \frac{\ln(64)}{\ln(4)}$$

$$2x = 3$$

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

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

3) $2^{-2r-2} = 4$

Without In

$$2^{-2r-2} = 2^2$$

$$-2r-2=2$$

$$\frac{-2r+4}{-2-2}$$

$$-2r = 4$$

$$r = -2$$

With In

$$\ln(2^{-2r-2}) = \ln(4)$$

$$\frac{(-2r-2) \ln(2)}{\ln(2)} = \frac{\ln(4)}{\ln(2)}$$

$$-2r-2=2$$

$$\frac{-2r+4}{-2-2}$$

$$-2r = 4$$

$$r = -2$$

4) $16^{2a+3} = \frac{1}{64}$

Without In

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

$$2(2a+3) = -3$$

$$\frac{4a+6}{-6-6} = -3$$

$$4a = -9$$

$$a = -\frac{9}{4}$$

With In

$$\ln(16^{2a+3}) = \ln\left(\frac{1}{64}\right)$$

$$\frac{(2a+3) \ln(16)}{\ln(16)} = \frac{\ln\left(\frac{1}{64}\right)}{\ln(16)}$$

$$2a+3 = -1.5$$

$$\frac{2a-4.5}{-3-3}$$

$$2a = -4.5$$

$$a = -2.25 = -\frac{9}{4}$$

5) $16^{2n-2} = \frac{1}{4}$

Without In

$$4^{2(2n-2)} = 4^{-1}$$

$$2(2n-2) = -1$$

$$\frac{4n-4}{+4+4} = -1$$

$$4n = 3$$

$$n = \frac{3}{4}$$

With In

$$\ln(16^{2n-2}) = \ln\left(\frac{1}{4}\right)$$

$$\frac{(2n-2) \ln(16)}{\ln(16)} = \frac{\ln\left(\frac{1}{4}\right)}{\ln(16)}$$

$$2n-2 = -0.5$$

$$\frac{2n-2}{+2+2} = -0.5$$

$$2n = 1.5$$

$$n = 0.75 = \frac{3}{4}$$

6) $16^{2b} = 4$

Without In

$$4^{2(2b)} = 4^1$$

$$2(2b) = 1$$

$$\frac{4b}{4+4} = 1$$

$$b = \frac{1}{4}$$

With In

$$\ln(16^{2b}) = \ln(4)$$

$$\frac{2b \ln(16)}{\ln(16)} = \frac{\ln(4)}{\ln(16)}$$

$$2b = 0.5$$

$$\frac{2b}{2} = \frac{0.5}{2}$$

$$b = 0.25 = \frac{1}{4}$$

$$7) 3^{2k} = 9$$

Without In

$$3^{2k} = 3^2$$

$$\frac{2k}{2} = \frac{2}{2}$$

$$k = 1$$

With In

$$\ln(3^{2k}) = \ln(9)$$

$$\frac{2k \cdot \ln(3)}{\ln(3)} = \frac{\ln(9)}{\ln(3)}$$

$$\frac{2k}{2} = \frac{2}{2}$$

$$k = 1$$

$$8) 27^{n-3} = 9$$

Without In

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

$$3(n-3) = 2$$

$$\frac{3n-9}{+9 \quad +9} = 2$$

$$\frac{3n}{3} = \frac{11}{3}$$

$$n = \frac{11}{3}$$

With In

$$\ln(27^{n-3}) = \ln(9)$$

$$\frac{(n-3) \ln(27)}{\ln(27)} = \frac{\ln(9)}{\ln(27)}$$

$$\frac{n-3}{+3 \quad +3} = \frac{0.6}{3}$$

$$n = 3.6 = \frac{11}{3}$$

$$9) 4^{-3x} = 64$$

Without In

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

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

$$x = -1$$

With In

$$\ln(4^{-3x}) = \ln(64)$$

$$\frac{-3x \cdot \ln(4)}{\ln(4)} = \frac{\ln(64)}{\ln(4)}$$

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

$$x = -1$$

$$10) 6^{-x} = 36$$

Without In

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

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

$$x = -2$$

With In

$$\ln(6^{-x}) = \ln(36)$$

$$\frac{-x \cdot \ln(6)}{\ln(6)} = \frac{\ln(36)}{\ln(6)}$$

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

$$x = -2$$

$$11) 6^{3n-1} = 216$$

Without In

$$6^{3n-1} = 6^3$$

$$\frac{3n-1}{+1 \quad +1} = 3$$

$$\frac{3n}{3} = \frac{4}{3}$$

$$n = \frac{4}{3}$$

With In

$$\ln(6^{3n-1}) = \ln(216)$$

$$\frac{(3n-1) \cdot \ln(6)}{\ln(6)} = \frac{\ln(216)}{\ln(6)}$$

$$\frac{3n-1}{+1 \quad +1} = 3$$

$$\frac{3n}{3} = \frac{4}{3}$$

$$n = \frac{4}{3}$$

$$12) 64^{-3x} = 16$$

Without In

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

$$\frac{-9x}{-9} = \frac{2}{-9}$$

$$x = -\frac{2}{9}$$

With In

$$\ln(64^{-3x}) = \ln(16)$$

$$\frac{-3x \cdot \ln(64)}{\ln(64)} = \frac{\ln(16)}{\ln(64)}$$

$$\frac{-3x}{-3} = \frac{0.6}{-3}$$

$$x = -0.2 = -\frac{2}{9}$$