

## 9.6 Practice – Solve Exp. And Log Equations

Name: Solutions

Solve each equation by getting the same bases and equating exponents.

1.  $16^{-3a-1} = 8$

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

$$-12a-4=3$$

$$a = -\frac{7}{12}$$

2.  $8^{3-p} = 64$

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

$$3-p=2$$

$$p = 1$$

3.  $\frac{16^n}{2} = 32^{5n-1}$

$$2^{4n} = (2^5)^{5n-1}$$

$$4n-1=25n-5$$

$$-21n=-4$$

$$n = \frac{4}{21}$$

4.  $\frac{27^x}{3} = 9^{2-x}$

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

$$3^{3x-1} = 3^{4-2x}$$

$$3x-1=4-2x$$

$$5x=5$$

$$x = 1$$

5.  $(\frac{1}{25})^{2m-6} = 125^{m+1}$

$$(\frac{1}{5^2})^{2m-6} = (5^3)^{m+1}$$

$$-4m+12=3m+3$$

$$m = \frac{9}{7}$$

6.  $(\frac{1}{36})^{-3k-3} = 216^{-3k+3}$

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

$$6k+6=-9k+9$$

$$k = \frac{1}{5}$$

Solve each equation. Round your answers to three decimal places.

7.  $7 \log_9 m = -14$

$$\log_9 m = -2$$

$$9^{\log_9 m} = 9^{-2}$$

$$m \approx 0.012$$

8.  $-5 + \log_{12} n = -6$

$$\log_{12} n = -1$$

$$12^{\log_{12} n} = 12^{-1}$$

$$n \approx 0.083$$

9.  $e^{x-1} = 38$

$$\ln e^{x-1} = \ln 38$$

$$x-1 = \ln 38$$

$$x \approx 4.638$$

10.  $9^{x+7} = 61$

$$\log_9 9^{x+7} = \log_9 61$$

$$x+7 = \log_9 61$$

$$x \approx -5.129$$

11.  $-\log_5(-n) = -2$

$$\log_5(-n) = 2$$

$$-n = 25$$

$$n = -25$$

12.  $17^{9n} - 10 = 1$

$$17^{9n} = 11$$

$$\log_{17} 17^{9n} = \log_{17} 11$$

$$9n = \log_{17} 11$$

$$n \approx 0.137$$

13.  $3^{x-5} = 12$

$$\log_3 3^{x-5} = \log_3 12$$

$$x-5 = \log_3 12$$

$$x \approx 7.262$$

14.  $2 - \log_4(w) = -2$

$$-\log_4 w = -4$$

$$\log_4 w = 4$$

$$w = 256$$

15.  $8 - 5^{3x} = 6$

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

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

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

$$3x = \log_5 2$$

$$x \approx 0.144$$

16.  $\ln(x+1) = 5$

$$e^{\ln(x+1)} = e^5$$

$$x+1 = e^5$$

$$x \approx 147.413$$

17.  $\ln x + 1 = 5$

$$\ln x = 4$$

$$e^{\ln x} = e^4$$

$$x \approx 54.598$$

18.  $-5(16)^{m-7} = -45$

$$16^{m-7} = 9$$

$$\log_{16} 16^{m-7} = \log_{16} 9$$

$$m-7 = \log_{16} 9$$

$$m \approx 7.792$$

$$19. 8 \log_2(x-8) = 24$$

$$\log_2(x-8) = 3$$

$$x-8=8$$

$$x=16$$

$$20. 1 + 2(8)^{n-9} = 71$$

$$2 \cdot 8^{n-9} = 70$$

$$8^{n-9} = 35$$

$$\log_8 8^{n-9} = \log_8 35$$

$$n-9 = \log_8 35$$

$$n \approx 10.71$$

$$21. 10 - 2 \log_2(k-2) = 4$$

$$-2 \log_2(k-2) = -6$$

$$\log_2(k-2) = 3$$

$$k-2=8$$

$$k=10$$

$$22. 6 - 4(17)^{m-10} = 94$$

$$-4 \cdot 17^{m-10} = 88$$

$$17^{m-10} = -22$$

$$\log_{17} 17^{m-10} = \log_{17} (-22)$$

$$m-10 = \text{Nonreal \#}$$

$$\text{No solution}$$

$$23. -7 \log_6(-4a) + 4 = 18$$

$$-7 \log_6(-4a) = 14$$

$$\log_6(-4a) = -2$$

$$-4a = \frac{1}{36}$$

$$a \approx -0.007$$

$$24. 10(15)^{10r-8} - 1 = 6$$

$$10 \cdot 15^{10r-8} = 7$$

$$15^{10r-8} = \frac{7}{10}$$

$$\log_{15} 15^{10r-8} = \log_{15} \left(\frac{7}{10}\right)$$

$$10r-8 = \log_{15} \left(\frac{7}{10}\right)$$

$$r \approx 0.787$$

$$25. -8e^{6-3x} - 8 = -33$$

$$-8e^{6-3x} = -25$$

$$e^{6-3x} = \frac{25}{8}$$

$$\ln e^{6-3x} = \ln \frac{25}{8}$$

$$6-3x = \ln \frac{25}{8}$$

$$x \approx 1.62$$

$$26. 7 + 6 \log_8(n+6) = 1$$

$$6 \log_8(n+6) = -6$$

$$\log_8(n+6) = -1$$

$$n+6 = 8^{-1}$$

$$n \approx -5.875$$

$$27. -7e^{-9n-8} - 9 = -39$$

$$-7e^{-9n-8} = -30$$

$$e^{-9n-8} = \frac{30}{7}$$

$$-9n-8 = \ln \left(\frac{30}{7}\right)$$

$$n \approx -1.051$$

$$28. 8 - 2 \ln 7n = 5$$

$$-2 \ln(7n) = -3$$

$$\ln(7n) = \frac{3}{2}$$

$$7n = e^{\frac{3}{2}}$$

$$n \approx 0.64$$

$$29. -4(11)^{2x-2} + 2 = -37$$

$$-4 \cdot 11^{2x-2} = -39$$

$$11^{2x-2} = \frac{39}{4}$$

$$\log_{11} 11^{2x-2} = \log_{11} \left(\frac{39}{4}\right)$$

$$2x-2 = \log_{11} \left(\frac{39}{4}\right)$$

$$x \approx 1.475$$

$$30. -9 \ln 10x + 10 = -26$$

$$-9 \ln(10x) = -36$$

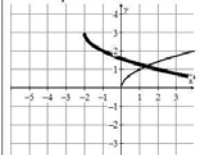
$$\ln(10x) = 4$$

$$10x = e^4$$

$$x \approx 5.46$$

### Algebra Skills:

1. Below are graphs of  $f(x) = \sqrt{x}$  (thin line) and its translation (bold line). Write an equation of the translation.



$$f(x) = -\sqrt{x+2} + 3$$

Simplify the fraction by rationalizing the denominator.

$$2. \frac{3}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{2}$$

$$3. \frac{4}{3\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{4\sqrt{6}}{3 \cdot 6}$$

$$\frac{2\sqrt{6}}{9}$$

Solve by factoring.

$$4. 2x^3 + 18x^2 + 40x = 0$$

$$2x(x^2 + 9x + 20) = 0$$

$$2x(x+4)(x+5) = 0$$

$$x=0, x=-4, \text{ or } x=-5$$

$$5. 9x^2 - 30x + 9 = 0$$

$$3(3x - 10x + 3) = 0$$

$$3(3x-1)(x-3) = 0$$

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

### SAT Prep:

1. Simplify:  $(3^{x-2})(3^{3x+1})$

$$(A) (3)^{4x-1}$$

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

$$(C) (9)^{4x-1}$$

$$(D) (9)^{3x^2-5x-2}$$

$$x-2 + 3x+1 = 4x-1$$

2. If  $f(x) = 21(3)^{x+4}$ , find  $f(-6)$ .

$$f(-6) = 21(3)^{-6+4}$$

$$= 21(3)^{-2}$$

$$= 21\left(\frac{1}{9}\right)$$

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

