

Evaluate each expression.

1. $(9^2 + 216^3)^{-\frac{1}{2}}$

$$\begin{aligned} & (3+6)^{-1/2} \\ & (9)^{-1/2} \\ & \left(\frac{1}{9}\right)^{1/2} = \left(\frac{1}{3}\right) \end{aligned}$$

2. $81^{\frac{3}{4}}$

$$27$$

3. $\frac{1}{(\sqrt[4]{25})^2}$

$$\frac{1}{(25)^{2/4}} = \frac{1}{5}$$

Simplify each expression.

4. $\left(\frac{32x^4y^4}{4x^{-2}y}\right)^{\frac{2}{3}}$

$$\frac{(8x^6y^3)^{2/3}}{4x^4y^2}$$

5. $\left(\frac{9x^3y^3}{x^{-1}y}\right)^{\frac{3}{2}}$

$$\frac{(9x^4y^2)^{3/2}}{27x^6|y|^3}$$

6. $\left(\frac{8y^6}{y^{-3}}\right)^{\frac{1}{3}}$

$$\frac{(8y^9)^{1/3}}{2y^3}$$

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

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

8. $\left(\left(2a\right)^{\frac{1}{3}}\left(a^2b\right)^{\frac{1}{3}}\right)^3$

$$\frac{(2^{1/3}a^{1/3}a^{2/3}b^{1/3})^3}{(2^{1/3}ab^{1/3})^3}$$

$$2a^3b$$

9. $(3x^{\frac{1}{2}}y^{\frac{1}{4}})(4x^2y^2)$

$$12x^{5/2}y^{9/4}$$

10. $\frac{4x^0y^{-2}z^3}{4x}$

$$\frac{z^3}{xy^2}$$

11. $x^2y^{-4} \cdot x^3y^2$

$$\frac{x^5y^{-2}}{y^2}$$

12. $(2x^2)^{-4}$

$$\frac{1}{16x^8}$$

13. $(x^3y^{-2}z^{\frac{1}{3}})^6$

$$x^{18}y^{-12}z^2$$

$$\boxed{\frac{x^{18}z^2}{y^{12}}}$$

14. $\sqrt{xy^2} \cdot \sqrt{x^3y^3}$

$$\sqrt{x^4y^5}$$

$$\boxed{x^2y^2\sqrt{y}}$$

15. $\left(\frac{27y^4}{y}\right)^2$

$$(27y^3)^2$$

$$\boxed{729y^6}$$

16. Express $\sqrt[3]{27x^4y^6}$ using rational exponents.

$$27^{\frac{1}{3}}x^{\frac{4}{3}}y^2$$

$$\boxed{3x^{\frac{4}{3}}y^2}$$

17. Express $(2x^2)^{\frac{1}{3}}(2x)^{\frac{1}{2}}$ using the same radical.

$$(2x^2)^{\frac{2}{6}}(2x)^{\frac{3}{6}}$$

$$\sqrt[6]{(2x^2)^2(2x)^3}$$

$$\sqrt[6]{4x^4 \cdot 8x^3}$$

$$\sqrt[6]{32x^7}$$

$$\boxed{|x| \sqrt[6]{32x}}$$

Graph the following on a separate sheet of graph paper.

18. $y = 2^{-x}$

19. $y \leq 4^x$

20. $y \leq \log_2(x+2)$

21. $y = 3^x - 1$

Equations:

Exponential growth/decay: $N = N_0(1+r)^t$ (population)
 $N = N_0e^{kt}$

Compounding interest a certain number of times a year: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Compounding interest continuously: $A = Pe^{rt}$

Doubling time: $t = \frac{\ln 2}{k}$

ation is

decreasing exponentially at a rate of 4.3% per year, what is the expected population in 2002?

$$640(1-0.043)^{11}$$

395 salmon

23. Compare the balance after 12 years of a \$4000 investment earning 9% interest that is compounded continuously to the same investment compounded monthly.

$$4000\left(1+\frac{0.09}{12}\right)^{12(12)}$$

\$11,731.35

$$4000e^{0.09(12)}$$

\$11,778.72

\$47.37
more

24. In 2008, there were 512 students at Clawson high school. There has been an annual increase of 4% over the last few years. Assume that the increase will continue and predict the population at Clawson in 2015.

$$512(1+0.04)^7$$

674 students

25. A scientist has 86 grams of a radioactive substance that decays at an exponential rate. Assuming $k = -0.4$, how many grams of radioactive substance remains after 10 days.

$$86e^{-0.4(10)}$$

1.6 grams

26. Find the amount of time in years required for an investment to double at a rate of 6.2% if the interest is compounded continuously.

$$\frac{\ln 2}{0.062}$$

11.2 years

27. If your Grandparents left you an inheritance of \$25,000, what average annual investment rate would be necessary for you to accumulate \$1 million in a mutual fund at retirement in 45 years?

$$1,000,000 = 25,000(1+r)^{45}$$

$$40 = (1+r)^{45}$$

$$1.085 = 1+r$$

$$0.085 = r$$

8.5%

28. Write $16^{\frac{3}{4}} = 8$ logarithmic form.

$$\log_{16} 8 = \frac{3}{4}$$

30. Solve $\log_2(x+6) + \log_2 3 = 2\log_2 6$.

$$\log_2 (x+6)(3) = \log_2 36$$

$$3x+18 = 36$$

$$3x = 18 \quad (x=6)$$

32. Evaluate $\log_2(2x) = \log_2(4x-10)$.

$$2x = 4x - 10$$

$$-2x = -10$$

$$(x=5)$$

34. Solve $6^{x-1} = 8^{2-x}$.

$$(x-1)\log 6 = (2-x)\log 8$$

$$x\log 6 - \log 6 = 2\log 8 - x\log 8$$

$$x\log 6 + x\log 8 = 2\log 8 + \log 6$$

$$x(\log 6 + \log 8) = 2\log 8 + \log 6$$

36. $15e^{2x} > 30$

$$1.5372$$

$$e^{2x} > 2$$

$$2x > \ln 2$$

$$(x > 0.3466)$$

29. Evaluate $\log_4 \frac{1}{64}$.

$$4^x = \frac{1}{64}$$

$$x \log 4 = \log \frac{1}{64} \quad (x = -3)$$

31. Evaluate $\log_4 48 - \frac{1}{2} \log_4 x = \log_4 8$.

$$\log_4 48 - \log_4 x^{1/2} = \log_4 8$$

$$\log_4 \frac{48}{x^{1/2}} = \log_4 8 \quad 48 = 8x^{1/2}$$

$$\frac{48}{x^{1/2}} = 8 \quad 6 = x^{1/2}$$

$$36 = x$$

33. Find the value of $\log_3 92.4$

$$\frac{\log 92.4}{\log 3}$$

$$4.1199$$

35. Solve $10(6 - e^{4x}) < 40$.

$$6 - e^{4x} < 4$$

$$-e^{4x} < -2$$

$$e^{4x} > 2$$

$$4x > \ln 2$$

37. $2e^{2t} = 5e^{t-1}$

$$e^{2t} = 2.5e^{t-1}$$

$$\ln e^{2t} = \ln 2.5 + \ln e^{t-1}$$

$$2t = \ln 2.5 + t - 1$$

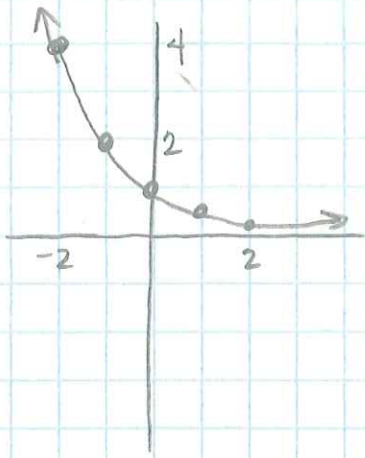
$$t = \ln 2.5 - 1$$

$$t = -0.0837$$

$$(x > 0.1733)$$

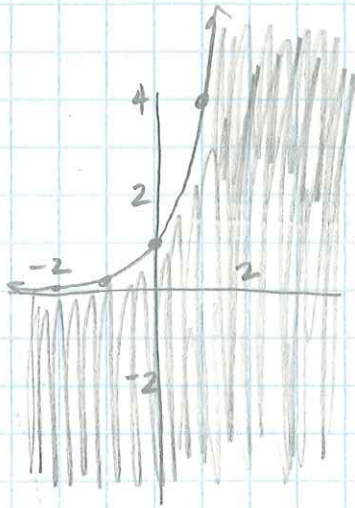
18)

x	y
-2	4
-1	2
0	1
1	1/2
2	1/4



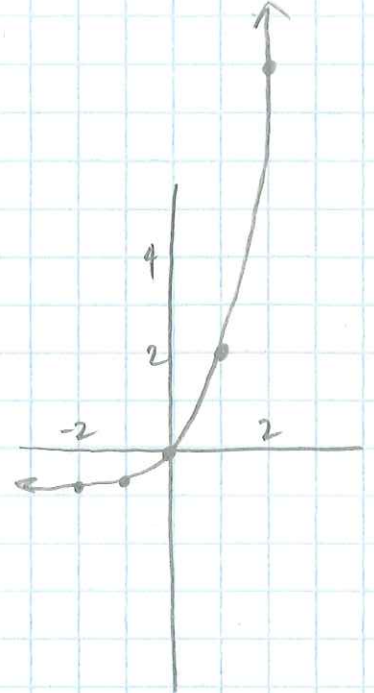
19)

x	y
-2	0.06
-1	0.25
0	1
1	4
2	16



21) $3^x - 1$

x	y
-2	-0.9
-1	-0.7
0	0
1	2
2	8



20) $2^y = x + 2$

$2^y - 2 = x$

x	y
-1.75	-2
-1.5	-1
-1	0
0	1
2	2

