

Evaluate and/or simplify

1. $16^{\frac{3}{4}}$
 $(2^4)^{\frac{3}{4}} = 2^3 = \boxed{8}$

2. $25^{-\frac{3}{2}}$
 $(5^2)^{-\frac{3}{2}} = 5^{-3} = \boxed{\frac{1}{125}}$

3. $(2x^{\frac{1}{6}})(4x^{\frac{1}{3}})$
 $8x^{\frac{3}{6}} = \boxed{8x^{\frac{1}{2}}}$

4. $\left(\frac{64x^9y^{12}}{125x^2y^9}\right)^{\frac{1}{3}}$

5. $\log_2 32 = x$

$2^x = 32$
 $2^x = 2^5 \quad \boxed{x=5}$

6. $\log_2 \frac{1}{64} = x$

$2^x = \frac{1}{64}$
 $2^x = 2^{-6} \quad \boxed{x=-6}$

7. $\log_2 \sqrt[8]{2} = x$

$2^x = 2^{\frac{1}{8}}$
 $\boxed{x = \frac{1}{8}}$

8. $\log_4(\log_2 16)$

$\log_4(4) = x$
 $4^x = 4 \quad \boxed{x=1}$

9. Write in exponential form:

a) $\log_3 x = 4$

$3^4 = x$

b) $\log_2 x = 5$

$2^5 = x$

10. Write in logarithmic form:

a) $5^x = 26$

$\log_5 26 = x$

b) $e^x = 4$

$\log_e 4 = x$

$\ln 4 = x$

Solve each equation. Round to three decimal places when necessary.

11. $4^{2x-3} = 8^{x+2}$

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

$2^{4x-6} = 2^{3x+6}$

$4x-6 = 3x+6$

$\boxed{x=12}$

12. $\log_2(3x-1) = 3$

$2^3 = 3x-1$

$8 = 3x-1$

$9 = 3x$

$\boxed{3 = x}$

13. $3^{x-3} - 4 = 14$

$3^{x-3} = 18$

$\log_3 18 = x-3$

$\boxed{x = 5.631}$

14. $3\log_2(2x-1) = 3$

$\log_2(2x-1) = 1$

$2^1 = 2x-1$

$3 = 2x$

$\boxed{1.5 = x}$

15. $2e^{x-3} - 4 = 16$

$2e^{x-3} = 20$

$e^{x-3} = 10$

$\ln 10 = x-3$

$\boxed{x = 5.303}$

16. $\sqrt{x+1} + x = 5$

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

$x+1 = 25 - 10x + x^2$

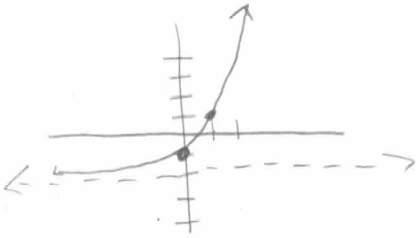
$0 = x^2 - 11x + 24$

$0 = (x-8)(x-3)$

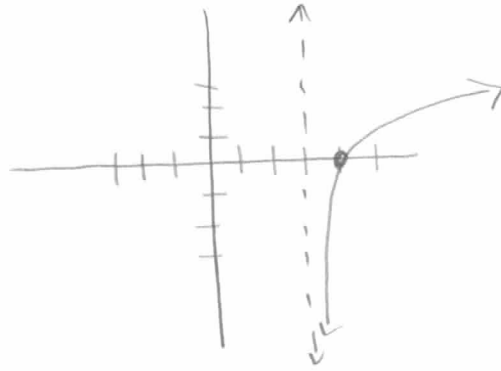
$x = \cancel{8}, \boxed{3}$

Graph each function.

17. $f(x) = -2 + 3^x$



18. $f(x) = \log_2(x-3)$



19. The population of a country is currently 150,000. Studies show this country's population is increasing 4% each year. How many years (to the nearest hundredth) will it take for the country's population to reach 225,000?

$$y = 150,000(1.04)^t$$

$$225,000 = 150,000(1.04)^t$$

$$1.5 = 1.04^t$$

$$\log_{1.04} 1.5 = t$$

$$10.34 \text{ yrs} = t$$

20. The equation $A = 15.4e^{0.023t}$ models the population of New York, A , in millions, t years after 2006.

a. What was the population of New York in 2006?

15.4 million

b. During what year will the population reach 25 million?

$$25 = 15.4e^{0.023t}$$

$$1.623 = e^{0.023t}$$

$$\ln 1.623 = 0.023t$$

$$21.07 \text{ yrs} = t$$

early
in 2027