

1. Solve the system below for x, y and z.

$$\begin{array}{l} 2(-4x - 6y + 5z = 21) \\ 3 \quad 5(3x + 4y - 2z = -15) \\ 2 \quad (-7x - 5y + 3z = 15) \\ \hline -8x - 12y + 10z = 42 \\ 15x + 20y - 10z = -75 \\ \hline 7x + 8y = -33 \\ 9x + 12y - 6z = -45 \\ -14x - 10y + 6z = 30 \\ \hline -5x + 2y = -15 \end{array}$$

$$\begin{array}{r} 7x + 8y = -33 \\ -4(-5x + 2y = -15) \\ 7x + 8y = -33 \\ 20x - 8y = 60 \\ \hline 27x = 27 \\ x = 1 \end{array}$$

$$\begin{array}{r} 7(1) + 8y = -33 \\ 7 + 8y = -33 \\ 8y = -40 \\ y = -5 \end{array}$$

$$\begin{array}{r} 3(1) + 4(-5) - 2z = -15 \\ 3 - 20 - 2z = -15 \\ -17 - 2z = -15 \\ -2z = 2 \\ z = -1 \end{array}$$

$$(1, -5, -1)$$

2. Find the equation of the parabola passing through the three points (2, 81), (7, 6), and (10, 33).

$$\begin{array}{l} 81 = 4a + 2b + c \\ 6 = 49a + 7b + c \\ 33 = 100a + 10b + c \\ \hline 81 = 4a + 2b + c \\ -6 = 49a + 7b + c \\ 33 = 100a + 10b + c \\ \hline -75 = -45a - 5b \\ -81 = 4a + 2b + c \\ 33 = 100a + 10b + c \\ \hline -48 = 96a + 8b \end{array}$$

$$\begin{array}{r} 8(75 = -45a - 5b) \\ 5(-48 = 96a + 8b) \\ 600 = -360a - 40b \\ -240 = 480a + 40b \\ \hline 360 = 120a \\ 120 = 120 \\ a = 3 \end{array}$$

$$\begin{array}{r} 75 = -45(3) - 5b \\ 75 = -135 - 5b \\ 210 = -5b \\ b = -42 \end{array}$$

$$\begin{array}{r} 81 = 4(3) + 2(-42) + c \\ 81 = 12 - 84 + c \\ 81 = -72 + c \\ c = 153 \end{array}$$

$$y = 3x^2 - 42x + 153$$

3. Solve the equation for x. Round to three decimal places.

$$\begin{array}{l} 3(7^x) + 4 = 124 \\ 3(7^x) = 120 \\ 7^x = 40 \end{array}$$

$$\begin{array}{l} \log 7^x = \log 40 \\ x \log 7 = \frac{\log 40}{\log 7} \end{array}$$

$$x \approx 1.896$$

4. Solve the equations below for x. Round to three decimal places.

$$\begin{array}{l} \log_7 49 = x \\ 7^x = 49 \\ x = 2 \end{array}$$

$$\begin{array}{l} 7x^8 = 294 \\ 7 \\ \sqrt[8]{x^8 = 41.2} \\ x \approx 1.596 \end{array}$$

$$5(3.14)^x = 18$$

$$\begin{array}{l} 3.14^x = 3.6 \\ \log 3.14^x = \log 3.6 \\ x \log 3.14 = \frac{\log 3.6}{\log 3.14} \\ x \approx 1.119 \end{array}$$

5. Rewrite the following logarithms using the Product and Quotient Rules.

$$\log(23 \cdot 3)$$

$$(\log 23 + \log 3)$$

$$\log_8 12 - \log_8 2$$

$$\begin{array}{l} \log_8 \frac{12}{2} \\ \log_8 6 \end{array}$$

$$\log_{13}(15x^2)$$

$$\begin{array}{l} \log_{13} 15 + \log_{13} x^2 \\ \log_{13} 15 + 2 \log_{13} x \end{array}$$

6. Find the inverse of the equations below. Use function notation and determine if the inverse is a function.

$$g(x) = (x+4)^2 + 1$$

$$\begin{aligned} x &= (y+4)^2 + 1 \\ \sqrt{x-1} &= \sqrt{(y+4)^2} \\ \pm\sqrt{x-1} &= y+4 \end{aligned}$$

$$\begin{aligned} y &= -4 \pm \sqrt{x-1} \\ g^{-1}(x) &= -4 \pm \sqrt{x-1} \end{aligned}$$

$$f(x) = \frac{x-6}{3}$$

$$\begin{aligned} x &= \frac{y-6}{3} \\ 3x &= y-6 \\ y &= 3x+6 \end{aligned}$$

$$f^{-1}(x) = 3x+6$$

- * 7. For each of the following pairs of functions, determine $f(g(x))$ and $g(f(x))$, then use the result to decide whether or not $f(x)$ and $g(x)$ are inverses of each other.

$$f(x) = 5x + 7$$

$$g(x) = \frac{x-7}{5}$$

$$f(g(x)) = f\left(\frac{x-7}{5}\right)$$

$$5\left(\frac{x-7}{5}\right) + 7$$

$$x-7+7$$

$$\boxed{x}$$

Inverses

$$g(f(x)) =$$

$$g(5x+7)$$

$$\frac{5x+7-7}{5}$$

$$\frac{5x}{5} = \boxed{x}$$

$$f(x) = x\sqrt{3} + 9$$

$$g(x) = \left(\frac{x-9}{\sqrt{3}}\right)^2$$

$$f(g(x))$$

$$f\left(\left(\frac{x-9}{\sqrt{3}}\right)^2\right)$$

$$\left(\frac{x-9}{\sqrt{3}}\right)\sqrt{3} + 9$$

$$\frac{(x-9)^2}{3}\sqrt{3} + 9$$

$$\frac{\sqrt{3}(x-9)^2}{3} + 9$$

$$\boxed{3(f(x))}$$

$$\boxed{3(x\sqrt{3}+9)}$$

$$\left(\frac{x\sqrt{3}+9-9}{\sqrt{3}}\right)^2$$

$$\left(\frac{x\sqrt{3}}{\sqrt{3}}\right)^2$$

$$\boxed{x^2}$$

Not Inverses

8.

The graph of $y = \log x$ is shown at right. Use this "parent graph" to graph each of the following equations. Explain how you get your new graphs.

$$y = \log(x-4)$$



move each point
on parent graph
4 units to the
right.

$$y = 6\log(x) + 3$$

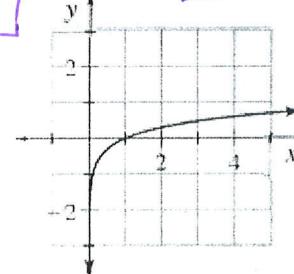


move each
point 3 units
up w/a
stretch of 6.

$$y = -\log x$$



the graph
flips over
the x-axis.



9. Solve the equations for x.

$$3(x-4)^2 + 6 = 33$$

$$\frac{x}{4} + \frac{x}{5} = \frac{9x-4}{20}$$

$$\frac{3(x-4)^2}{3} = \frac{27}{3}$$



$$\sqrt{(x-4)^2} = \sqrt{9}$$

$$x-4 = \pm 3$$

$$x = 4 \pm 3$$

$$\boxed{x = 7, 1}$$

$$20\left(\frac{x}{4} + \frac{x}{5}\right) = \left(\frac{9x-4}{20}\right)^2$$

$$5x + 4x = 9x - 4$$

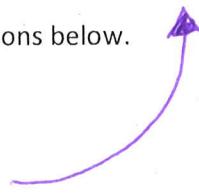
$$9x = 9x - 4$$

$0 = -4$
No solution!

$$\frac{-5}{x+2} \cdot \frac{(x+4)(x+2)}{5x} = \boxed{\frac{-(x+4)}{x}}$$

10. Simplify the rational expressions below.

$$\frac{-5(3x)}{(x-3)(x+2)} \div \frac{5x}{x^2 - x - 6 + x^2 + 6x + 8}$$



$$\begin{aligned} \frac{3x}{2x^2 - 8x} + \frac{2}{x-4} &= \frac{3x}{2x(x-4)} + \frac{2(2x)}{2x(x-4)} \\ &= \frac{3x + 4x}{2x(x-4)} = \frac{7x}{2x(x-4)} \\ &= \boxed{\frac{7}{2(x-4)}} \end{aligned}$$

→ 11. Solve the system below for x, y, and z.

$$2x + y - 3z = 13$$

$$-2(x - 3y + z = -21)$$

$$\underline{-2x + y + 4z = -7}$$

$$\begin{array}{r} 2x + y - 3z = 13 \\ -2x + 6y - 2z = 42 \\ \hline 7y - 5z = 55 \end{array}$$

$$\begin{array}{r} 2x + y - 3z = 13 \\ -2x + y + 4z = -7 \\ \hline 2y + z = 40 \end{array}$$

$$\begin{array}{l} 7y - 5z = 55 \\ 5(2y + z = 40) \end{array}$$

$$\begin{array}{l} 7y - 5z = 55 \\ 10y + 5z = 30 \\ \hline 17y = 85 \\ y = 5 \end{array}$$

$$\boxed{(-2, 5, -4)}$$

$$2(5) + z = 4$$

$$\begin{array}{l} 10 + z = 4 \\ z = -4 \end{array}$$

$$x - 3(5) + (-4) = -21$$

$$x - 15 - 4 = -21$$

$$x - 19 = -21$$

$$\boxed{x = -2}$$

12.

Pizza Planet sells three sizes of combination pizzas.

$$y = ax^2 + bx + c$$

Small (8" diameter)	\$8.50
Medium (10" diameter)	\$11.50
Large (13" diameter)	\$17.50

$$\begin{cases} (8, 8.50) \\ (10, 11.50) \\ (13, 17.50) \end{cases}$$

Assume that the price of the pizza can be modeled with a quadratic function, with the price dependent on the diameter of the pizza. Use the information to write three data points, and determine an equation representing the data points. If Pizza Planet is considering selling an Extra Large combination pizza, with an 18" diameter, what should such a pizza cost? If they wanted to sell a combination pizza for \$50.00, how big would it have to be to fit with the rest of the price data for the pizzas?

$$\begin{array}{r} 8.5 = 64a + 8b + c \\ 11.5 = 100a + 10b + c \\ 17.5 = 169a + 13b + c \end{array}$$

$$\begin{array}{r} -8.5 = 64a + 8b + c \\ 11.5 = 100a + 10b + c \end{array}$$

$$\boxed{3 = 36a + 2b}$$

$$\begin{array}{r} -11.5 = 100a + 10b + c \\ 17.5 = 169a + 13b + c \end{array}$$

$$\boxed{6 = 69a + 3b}$$

$$3(3 = 36a + 2b)$$

$$-2(6 = 69a + 3b)$$

$$\hline 9 = 108a + 6b$$

$$-12 = 138a - 6b$$

$$\hline -3 = -30a$$

$$\begin{array}{r} -3 \\ -30 \end{array}$$

$$\boxed{a = 0.1}$$

$$3 = 36(0.1) + 2b$$

$$3 = 3.6 + 2b$$

$$-0.6 = 2b$$

$$\boxed{-0.3 = b}$$

$$8.5 = 64(0.1) + 8(-0.3) + c$$

$$8.5 = 6.4 - 2.4 + c$$

$$8.5 = 4 + c$$

$$\boxed{4.5 = c}$$

$$\boxed{y = 0.1x^2 - 0.3x + 4.5}$$

$$18\text{" diameter} \rightarrow 0.1(18)^2 - 0.3(18) + 4.5 = \$31.50$$

$$50 = 0.1x^2 - 0.3x + 4.5$$

$$0 = 0.1x^2 - 0.3x - 45.5$$

$$0 = x^2 - 3x - 455$$

$$x = \frac{3 \pm \sqrt{9 - 4(1)(-455)}}{2}$$

$$x = \frac{3 \pm \sqrt{1829}}{2} \sim 22.89 \text{ diameter}$$

