Period 4, Oct 15, 2024

- Reflection about the y-axis ⇒ Even $F(-X)=F(X)$
- Reflection about the x-axis ⇒ $(X,Y) \Rightarrow (X,-Y)$
- Vertical stretch/shrink ⇒ goes up faster (stretch) or slower (shrink)
- Horizontal shift ⇒ moves left or right
- Horizontal stretch/shrink ⇒ spreads out (stretch) or comes together (shrink)
- Vertical shift ⇒ moves up/down

Reflect over x-axis

up or down

g(x)=±af(±bx±c)±d

determines vertical (shrink or stretch)

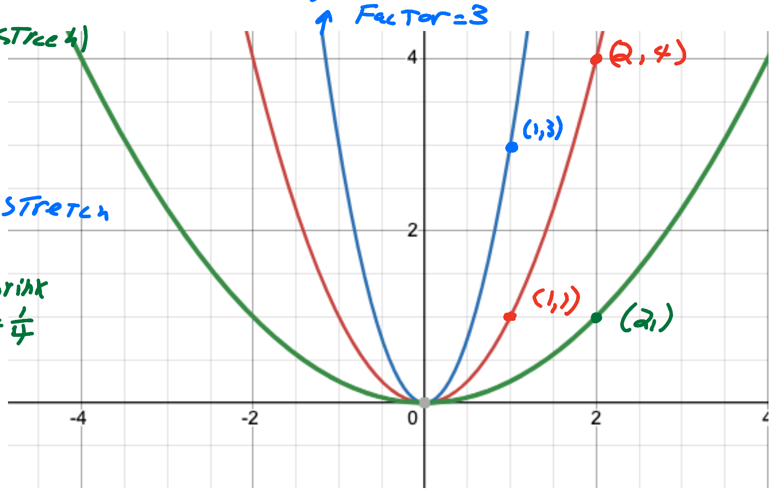
goes up fastest

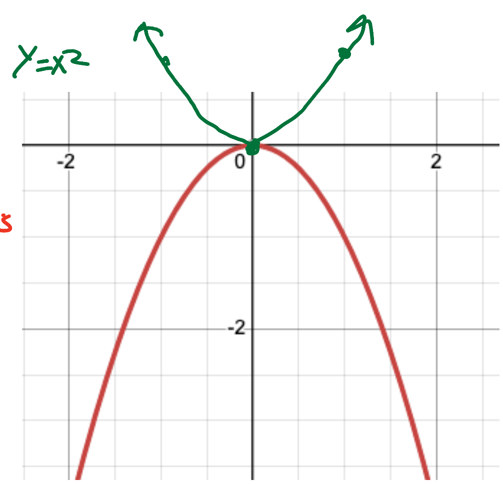
Factor=3

$x^2 = y$

$3x^2 = y$ ⇒ vertical stretch

$\frac{1}{4}x^2 = y$ = vertical shrink Factor = $\frac{1}{4}$





Reflect over X-axis

$y = -x^2$

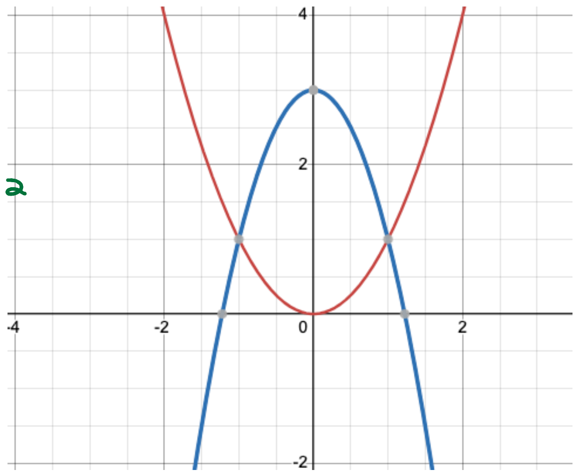
$x^2 = y$

$y = -2x^2 + 3$

Vertical stretch factor of 2

moves up 3

Reflects over X-axis



$x^2 = y$

$y = -2(x-1)^2 + 3$

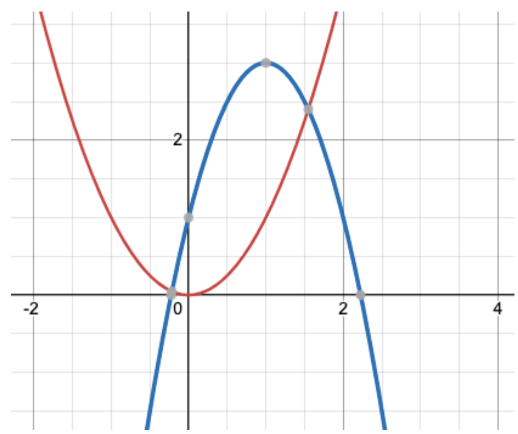
vertical stretch factor 2

up 3

Reflect over X-axis

Shift To Right 1 space

(set ( ) = 0)

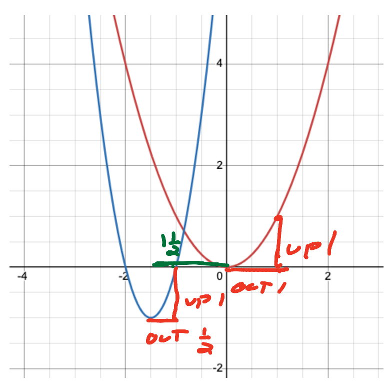


$x^2 = y$

$y = (2x+3)^2 - 1$

Horizontal Shrink Factor $\frac{1}{2}$

Shift Down 1



Shift Right or Left

$2x + 3 = 0$

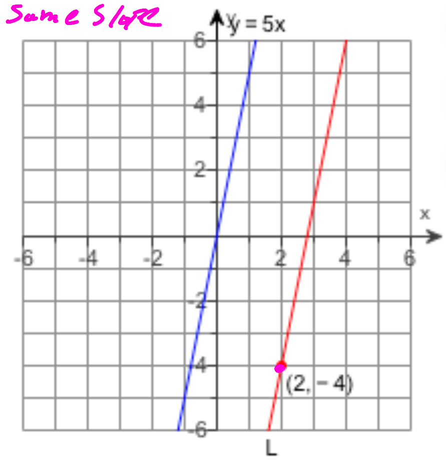
$-3 \quad -3$

$2x = -3 \Rightarrow x = \frac{-3}{2} = \text{Left } 1\frac{1}{2}$

Write an equation for line L in point-slope form and slope-intercept form.

L is parallel to y = 5x.

Same Slope



Line L Slope = 5

Point (2, -4)

x_1 y_1

Point Slope

$y - y_1 = m(x - x_1) \Rightarrow y - (-4) = 5(x-2)$

$y + 4 = 5(x-2)$

Slope intercept ↔ Solve For y

$y = mx + b$

$y = 5x + b$ (Plug in Point)

$-4 = 5(2) + b$

$-4 = 10 + b$

$-10 \quad -10$

$-14 = b$

$y = 5x - 14$

$y + 4 = 5(x-2)$

$y + 4 = 5x - 10$

$-4 \quad -4$

$y = 5x - 14$

Write the slope-intercept equation of the function f whose graph satisfies the given conditions.

$y = mx + b$

The graph of f passes through (− 4,3) and is perpendicular to the line that has an x-intercept of 1 and a y-intercept of − 2.

Point

To a Slope of 2

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

$(1, 0)$ x_1, y_1 $(0, -2)$ x_2, y_2

Slope

$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-0}{0-1} = \frac{-2}{-1} = 2$

$m = 2$

The equation of the function is $f(x) = -\frac{1}{2}x + 1$.

(Use integers or fractions for any numbers in the equation.)

Point $(-4, 3)$ $m = -\frac{1}{2}$

$y = -\frac{1}{2}x + b$

$3 = -\frac{1}{2}(-4) + b$

$3 = 2 + b$

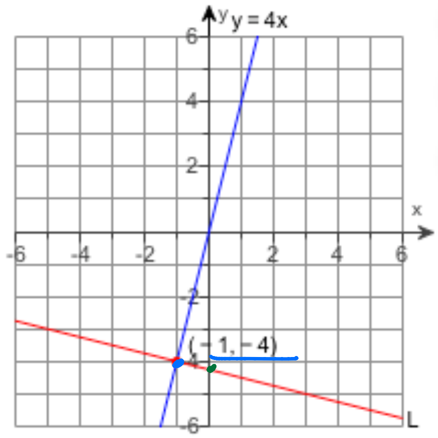
$-2 \quad -2$

$1 = b$

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

Write an equation for line L in point-slope form and slope-intercept form.

L is perpendicular to $y = 4x$.



$y = 4x$ has a slope of $4 = m$

L is perpendicular $m = -\frac{1}{4}$

Point $(-1,-4)$

$y-(-4) = -\frac{1}{4}(x-(-1)) = -\frac{1}{4}(x+1)$

$y + 4 = -\frac{1}{4}(x+1)$ = Point slope

Slope-intercept

$y + 4 = -\frac{1}{4}(x+1)$ Solve For y

$y + 4 = -\frac{1}{4}x - \frac{1}{4}$

$\quad -4 \qquad\qquad -4$

$\boxed{y = -\frac{1}{4}x - 4\frac{1}{4}}$

Write the slope-intercept equation of the function f whose graph satisfies the given conditions.

The graph of f is perpendicular to the line whose equation is $5x - 8y - 16 = 0$ and has the same y-intercept as this line.

Solve For y To Find Slope intercept Form

The equation of the function is $f(x) = -\frac{8}{5}x - 2$.

(Use integers or fractions for any numbers in the equation.)

$5x - 8y - 16 = 0$

$\quad +8y \qquad +8y$

$\frac{5x - 16}{8} = \frac{8y}{8}$

$\frac{5}{8}x - \frac{16}{8} = y$

$\frac{5}{8}x - 2 = y \qquad m = \frac{5}{8} \qquad$ y-int $= -2$

Perpendicular Line

$m = -\frac{8}{5} \qquad$ y-int $= -2$

$y = -\frac{8}{5}x - 2$

Suppose that a ball is rolling down a ramp. The distance traveled by the ball is given by the function $s(t) = 2t^2$, where t is the time, in seconds, after the ball is released, and s(t) is measured in feet. Find the ball's average velocity in each of the following time intervals.

a. $t_1 = 2$ to $t_2 = 3$

$\frac{\Delta s}{\Delta t} = 10$ ft/sec

b. $t_1 = 2$ to $t_2 = 2.5$

$\frac{\Delta s}{\Delta t} = 9$ ft/sec

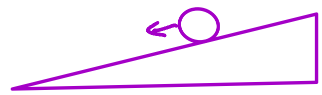
c. $t_1 = 2$ to $t_2 = 2.01$

$\frac{\Delta s}{\Delta t} = 8.02$ ft/sec (Type an exact answer, using integers or decimals.)

d. $t_1 = 2$ to $t_2 = 2.001$

$\frac{\Delta s}{\Delta t} = 8.002$ ft/sec (Type an exact answer, using integers or decimals.)

$S(T) = 2T^2$ = distance traveled by ball



$S(2) = 2(2)^2 = 8$ Feet

$S(3) = 2(3)^2 = 2 \cdot 9 = 18$ Feet

Traveled 10 Feet Took 1 sec

Velocity = $\frac{\text{Distance}}{\text{Time}}$

velocity = $\frac{10 \text{ Feet}}{1 \text{ second}} = 10$ FT/sec

$S(2) = 8$ Feet

$S(2.5) = 2(2.5)^2 = 12.5$ Feet

distance $12.5 - 8 = 4.5$ Feet

Time $2.5 - 2 = .5$ sec

Velocity $= \frac{4.5}{.5} = 9$ FT/sec

$S(2) = 8$ Feet

$S(2.01) = 2(2.01)^2 = 8.0802$ Feet

distance $8.0802 - 8$ Feet $= 0.0802$

Time $= 2.01 - 2 = .01$

Velocity $= \frac{0.0802}{0.01} = 8.02$ FT/sec

Determine whether the function is even, odd, or neither. Then determine whether the function's graph is symmetric with respect to the y-axis, the origin, or neither.

$f(x) = x^5 + 3x$

$F(x) = F(-x)$

Even = Reflected over y-axis

$F(-x) = -F(x)$

odd = Reflected over origin

$F(x) = x^5 + 3x$

$-F(x) = -(x^5 + 3x) = -x^5 - 3x$

$F(-x) = (-x)^5 + 3(-x) = -x^5 - 3x$

$-F(x) = F(-x)$ Function is odd

Reflected over origin

Determine whether the function is even, odd, or neither. Then determine whether the function's graph is symmetric with respect to the y-axis, the origin, or neither.

neither

No reflecting

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

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

$-g(x) = -1(x^2 + x) = -x^2 - x$ nope

$g(-x) = (-x)^2 + (-x) = x^2 - x$ nope

Same $x^2 + y^2 = r^2 \Rightarrow$ circle center is at $(0,0)$

$(-x)^2 + y^2 = r^2$ Even — Reflected over y-axis

$(-x)^2 + (-y)^2 = r^2$ odd — Reflected over origin

$x^2 + y^2 = r^2$

Find the difference quotient of f; that is, find $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$, for the following function. Be sure to fully simplify.

$f(x) = \sqrt{11x}$

$F(x+h) = \sqrt{11(x+h)} = \sqrt{11x + 11h}$

$$\frac{\left(\sqrt{11(x+h)} - \sqrt{11x}\right)}{h} \cdot \frac{\left(\sqrt{11(x+h)} + \sqrt{11x}\right)}{\left(\sqrt{11(x+h)} + \sqrt{11x}\right)}$$

$$\frac{11(x+h) + \cancel{\sqrt{11x}\cdot\sqrt{11(x+h)}} - \cancel{\sqrt{11x}\cdot\sqrt{11(x+h)}} - 11x}{h\left(\sqrt{11(x+h)} + \sqrt{11x}\right)} = \frac{\cancel{11x} + 11h - \cancel{11x}}{h\left(\sqrt{11(x+h)} + \sqrt{11x}\right)}$$

$$\frac{11\cancel{h}}{\cancel{h}\left(\sqrt{11(x+h)} + \sqrt{11x}\right)} = \frac{11}{\left(\sqrt{11(x+h)} + \sqrt{11x}\right)}$$

Find and simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$ for the given function.

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

$F(x+h) = \frac{3}{x+h}$

$$\frac{\frac{x \cdot 3}{x(x+h)} - \frac{3(x+h)}{x(x+h)}}{h} = \frac{\frac{3x}{x(x+h)} - \frac{3x+3h}{x(x+h)}}{h} = \frac{\frac{\cancel{3x} - \cancel{3x} - 3h}{x(x+h)}}{\frac{h}{1}}$$

$$\frac{-3\cancel{h}}{x(x+h)} \cdot \frac{1}{\cancel{h}} = \frac{-3}{x(x+h)}$$

1 $y = (2x + 3)^2 - 1$

2 $y = (-2x + 3)^2 - 1$

Reflect over y-axis