

Graphical Transformations of Points

$f(x) = x^2 - 12x + 43$		
Coordinate (6, 7)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = 4f(x)$	$y = f(3x)$
	$y = 4(x^2 - 12x + 43)$	
		(2, 7)
Translation	$y = f(x) - 4$	$y = f(x + 3)$
		$y = (x + 3)^2 - 12(x + 3) + 43$
	(6, 3)	

$f(x) = \sin(x)$		
Coordinate (90, 1)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = 5f(x)$	$y = f(2x)$
		$y = \sin(2x)$
Translation	$y = f(x) + 7$	$y = f(x - 90)$
		(180, 1)

$f(x) = x^3 + 3x^2 - 5$		
Coordinate (-2, -1)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = 3f(x)$	$y = f(2x)$
Translation	$y = f(x) + 2$	$y = f(x + 6)$

$f(x) = \cos(x)$		
Coordinate (270, -1)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = \frac{1}{2}f(x)$	$y = f(-x)$
Translation	$y = f(x) - 2$	$y = f(x + 180)$

$f(x) = 4x - 7 - x^2$		
Coordinate (2, -3)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = -3f(x)$	$y = f(2x)$
Translation	$y = f(x) + 3$	$y = f(x - 2)$

$f(x) = x^2 + 10x + 31$		
Coordinate (-5, 6)	Vertical Transformation	Horizontal Transformation
Enlargement		
		$y = \left(-\frac{1}{3}x\right)^2 + 10\left(-\frac{1}{3}x\right) + 31$
	(-5, 24)	
Translation	$y = f(x) + \underline{\hspace{1cm}}$	$y = f(x + \underline{\hspace{1cm}})$
	$y = (x^2 + 10x + 31) + \underline{\hspace{1cm}}$	$y = (x + \underline{\hspace{1cm}})^2 + 10(x + \underline{\hspace{1cm}}) + 31$
	(-5, 12)	(-7, 6)

f(x)		
Coordinate (x, y)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = a f(x)$	$y = f(bx)$
	$y = a f(x)$	$y = f(bx)$
Translation	$y = f(x) + c$	$y = f(x + d)$
	$y = f(x) + c$	$y = f(x + d)$

f(x)		
Coordinate (x, y)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = \frac{1}{a} f(x)$	$y = f\left(\frac{1}{b}x\right)$
	$y = \frac{1}{a} f(x)$	$y = f(bx)$
Translation	$y = f(x) - c$	$y = f(x - d)$
	$y = f(x) - c$	$y = f(x - d)$

Graphical Transformations of Points (Solutions)

$f(x) = x^2 - 12x + 43$		
Coordinate (6, 7)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = 4f(x)$	$y = f(3x)$
	$y = 4(x^2 - 12x + 43)$	$y = (3x)^2 - 12(3x) + 43$
	(6, 28)	(2, 7)
Translation	$y = f(x) - 4$	$y = f(x + 3)$
	$y = (x^2 - 12x + 43) - 4$	$y = (x + 3)^2 - 12(x + 3) + 43$
	(6, 3)	(3, 7)

$f(x) = \sin(x)$		
Coordinate (90, 1)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = 5f(x)$	$y = f(2x)$
	$y = 5(\sin(x))$	$y = \sin(2x)$
	(90, 5)	(45, 1)
Translation	$y = f(x) + 7$	$y = f(x - 90)$
	$y = (\sin(x)) + 7$	$y = \sin(x - 90)$
	(90, 8)	(180, 1)

$f(x) = x^3 + 3x^2 - 5$		
Coordinate (-2, -1)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = 3f(x)$	$y = f(2x)$
	$y = 3(x^3 + 3x^2 - 5)$	$y = (2x)^3 + 3(2x)^2 - 5$
	(-2, -3)	(-1, -1)
Translation	$y = f(x) + 2$	$y = f(x + 6)$
	$y = (x^3 + 3x^2 - 5) + 2$	$y = (x + 6)^3 + 3(x + 6)^2 - 5$
	(-2, 1)	(-8, -1)

$f(x) = \cos(x)$		
Coordinate (270, -1)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = \frac{1}{2}f(x)$	$y = f(-x)$
	$y = \frac{1}{2}(\cos(x))$	$y = \cos(-x)$
	(270, $\frac{1}{2}$)	(-270, -1)
Translation	$y = f(x) - 2$	$y = f(x + 180)$
	$y = (\cos(x)) - 2$	$y = \cos(x + 180)$
	(270, -3)	(90, -1)

$f(x) = 4x - 7 - x^2$		
Coordinate (2, -3)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = -3f(x)$	$y = f(2x)$
	$y = -3(4x - 7 - x^2)$	$y = 4(2x) - 7 - (2x)^2$
	(2, 9)	(1, -3)
Translation	$y = f(x) + 3$	$y = f(x - 2)$
	$y = (4x - 7 - x^2) + 3$	$y = 4(x - 2) - 7 - (x - 2)^2$
	(2, 0)	(4, -3)

$f(x) = x^2 + 10x + 31$		
Coordinate (-5, 6)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = 4f(x)$	$y = f\left(-\frac{1}{3}x\right)$
	$y = 4(x^2 + 10x + 31)$	$y = \left(-\frac{1}{3}x\right)^2 + 10\left(-\frac{1}{3}x\right) + 31$
	(-5, 24)	(15, 6)
Translation	$y = f(x) + \underline{\hspace{1cm}}$	$y = f(x + \underline{\hspace{1cm}})$
	$y = (x^2 + 10x + 31) + \underline{\hspace{1cm}}$	$y = (x + \underline{\hspace{1cm}})^2 + 10(x + \underline{\hspace{1cm}}) + 31$
	(-5, 12)	(-7, 6)

f(x)		
Coordinate (x, y)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = a f(x)$	$y = f(bx)$
	$y = a f(x)$	$y = f(bx)$
	(x, by)	$(\frac{x}{b}, y)$
Translation	$y = f(x) + c$	$y = f(x + d)$
	$y = f(x) + c$	$y = f(x + d)$
	$(x, y + c)$	$(x - d, y)$

f(x)		
Coordinate (x, y)	Vertical Transformation	Horizontal Transformation
Enlargement	$y = \frac{1}{a} f(x)$	$y = f(\frac{1}{b}x)$
	$y = \frac{1}{a} f(x)$	$y = f(bx)$
	$(x, \frac{y}{a})$	(bx, y)
Translation	$y = f(x) - c$	$y = f(x - d)$
	$y = f(x) - c$	$y = f(x - d)$
	$(x, y - c)$	$(x + d, y)$

