Standard form calculator parabola

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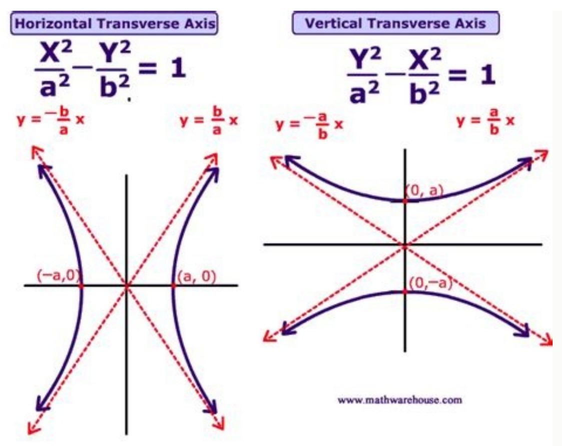
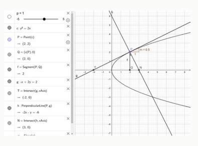
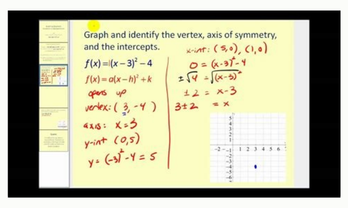
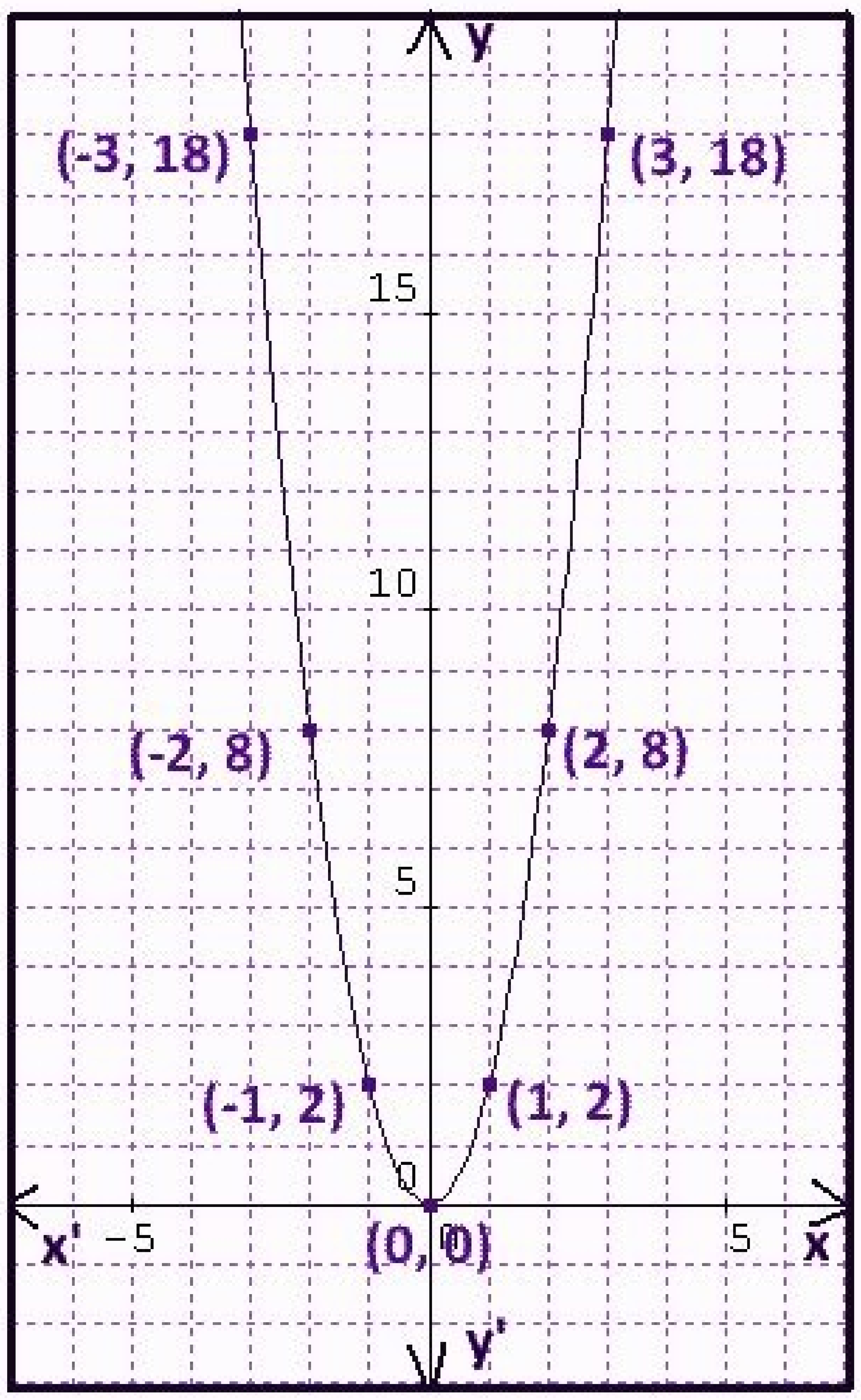






Quadratic Equation	x value of Vertex	y value of Vertex (plug x value into equation)	Vertex/ Line of Symmetry	Domain and Range
$y=x^2$ a = 1, b = 0, c = 0 Direction: Up	$-\frac{b}{2a}=-\frac{0}{2(1)}=0$	$y=0^2=0$	$(0,0)$ $x=0$	Domain: $(-\infty,\infty)$ Range: $[0,\infty)$
$y=-x^2$ a = −1, b = 0, c = 0 Direction: Down	$-\frac{b}{2a}=-\frac{0}{2(-1)}=0$	$y=-0^2=0$	$(0,0)$ $x=0$	Domain: $(-\infty,\infty)$ Range: $(-\infty,0]$
$y=5x^2-20$ a = 5, b = 0, c = − 20 Direction: Up	$-\frac{b}{2a}=-\frac{0}{2(5)}=-\frac{0}{10}=0$	$y=5(0)^2-20=-20$	$(0,-20)$ $x=0$	Domain: $(-\infty,\infty)$ Range: $[-20,\infty)$
$y=-2x^2+6x$ a = −2, b = 6, c = 0 Direction: Down	$-\frac{b}{2a}=-\frac{6}{2(-2)}=-\frac{6}{-4}=\frac{3}{2}$	$y=-2\left(\frac{3}{2}\right)^2+6\left(\frac{3}{2}\right)$ $=-\frac{9}{2}+9=\frac{9}{2}$	$\left(\frac{3}{2},\frac{9}{2}\right)$ $x=\frac{3}{2}$	Domain: $(-\infty,\infty)$ Range: $\left(-\infty,\frac{9}{2}\right]$
$y=-x^2+4x+3$ a = − 1, b = 4, c = 3 Direction: Down	$-\frac{b}{2a}=-\frac{4}{2(-1)}=-\frac{4}{-2}=2$	$y=-(2)^2+4(2)+3$ $=-4+8+3=7$	(2, 7) $x=2$	Domain: $(-\infty,\infty)$ Range: $(-\infty,7]$



Standard form of a parabola conics calculator. Standard form of parabola with vertex and focus calculator. How to graph a parabola in standard form calculator. Vertex to standard form calculator parabola. How to find the equation of a parabola standard form. General form to standard form calculator parabola. Write parabola in standard form calculator.

Once you have the quadratic formula and the basics of quadratic equations down cold, it's time for the next level of your relationship with parabolas: learning about their vertex form. Read on to learn more about the parabola vertex form and how to convert a quadratic equation from standard form to vertex form. feature image credit: SBA73/Flickr Why Is Vertex Form Useful? An Overview The vertex form of an equation is an alternate way of writing out the equation of a parabola. Normally, you'll see a quadratic equation written as ax^2+bx+c, which, when graphed, will be a parabola. From this form, it's easy enough to find the roots of the equation (where the parabola hits the x-axis) by setting the equation equal to zero (or using the quadratic formula). If you need to find the vertex of a parabola, however, the standard quadratic form is much less helpful. Instead, you'll want to convert your quadratic equation into vertex form. What Is Vertex Form? While the standard quadratic form is $ax^2+bx+c=y$, the vertex form of a quadratic equation is $\bi y=\bi a(\bi x-\bi h)^2+ \bi k$. In both forms, y is the y-coordinate, x is the x-coordinate, and a is the constant that tells you whether the parabola is facing up ($+a$) or down ($-a$). (I think about it as if the parabola was a bowl of applesauce; if there's a $+a$, I can add applesauce to the bowl; if there's a $-a$, I can shake the applesauce out of the bowl.) The difference between a parabola's standard form and vertex form is that the vertex form of the equation also gives you the parabola's vertex: (h,k). For example, take a look at this fine parabola, $y=3(x+4/3)^2-2$: Based on the graph, the parabola's vertex looks to be something like (-1.5,-2), but it's hard to tell exactly where the vertex is from just the graph alone. Fortunately, based on the equation $y=3(x+4/3)^2-2$, we know the vertex of this parabola is $(-4/3,-2)$. Why is the vertex $(-4/3,-2)$ and not $(4/3,-2)$ (other than the graph, which makes it clear both the x- and y-coordinates of the vertex are negative)? Remember: in the vertex form equation, h is subtracted and k is added. If you have a negative h or a negative k, you'll need to make sure that you subtract the negative h and add the negative k. In this case, this means: $y=3(x+4/3)^2-2=3(x-(-4/3))^2+(-2)$ and so the vertex is $(-4/3,-2)$. You should always double-check your positive and negative signs when writing out a parabola in vertex form, particularly if the vertex does not have positive x and y values (or for you quadrant-heads out there, if it's not in quadrant I). This is similar to the check you'd do if you were solving the quadratic formula ($x={-b±√{b^2-4ac}}/{2a}$) and needed to make sure you kept your positive and negatives straight for your as, bs, and cs. Below is a table with further examples of a few other parabola vertex form equations, along with their vertices. Note in particular the difference in the $(x-h)^2$ part of the parabola vertex form equation when the x coordinate of the vertex is negative. Parabola Vertex Form Vertex Coordinates $y=5(x-4)^2+17$ $(4,17)$ $y=2/3(x-8)^2-1/3$ $(8,-1/3)$ $y=144(x+1/2)^2-2$ $(-1/2,-2)$ $y=1.8(x+2.4)^2+2.4$ $(-2.4,2.4)$ How to Convert From Standard Quadratic Form to Vertex Form Most of the time when you're asked to convert quadratic equations between different forms, you'll be going from standard form (ax^2+bx+c) to vertex form ($a(x-h)^2+k$). The process of converting your equation from standard quadratic to vertex form involves doing a set of steps called completing the square. (For more about completing the square, be sure to read this article.) Let's walk through an example of converting an equation from standard form to vertex form. We'll start with the equation $y=7x^2+42x-3/14$. The first thing you'll want to do is move the constant, or the term without an x or x^2 next to it. In this case, our constant is $-3/14$. (We know it's negative $3/14$ because the standard quadratic equation is ax^2+bx+c, not ax^2+bx-c.) First, we'll take that $-3/14$ and move it over to the left side of the equation: $y+3/14=7x^2+42x$ The next step is to factor out the 7 (the a value in the equation) from the right side, like so: $y+3/14=7(x^2+6x)$ Great! This equation is looking much more like vertex form, $y=a(x-h)^2+k$. At this point, you might be thinking, "All I need to do now is to move the $3/14$ back over to the right side of the equation, right?" Alas, not so fast. If you take a look at part of the equation inside of the parentheses, you'll notice a problem: it's not in the form of $(x-h)^2$. There are too many xs! So we're not quite done yet. What we need to do now is the hardest part—completing the square. Let's take a closer look at the x^2+6x part of the equation. In order to factor (x^2+6x) into something resembling $(x-h)^2$, we're going to need to add a constant to the inside of the parentheses—and we're going to need to remember to add that constant to the other side of the equation as well (since the equation needs to stay balanced). To set this up (and make sure we don't forget to add the constant to the other side of the equation), we're going to create a blank space where the constant will go on either side of the equation: $y+3/14+7($ $)=7(x^2+6x+$ $)$ Note that on the left side of equation, we made sure to include our a value, 7, in front of the space where our constant will go; this is because we're not just adding the constant to the right side of the equation, but we're multiplying the constant by whatever is on the outside of the parentheses. (If your a value is 1, you don't need to worry about this.) The next step is to complete the square. In this case, the square you're completing is the equation inside of the parentheses—by adding a constant, you're turning it into an equation that can be written as a square. To calculate that new constant, take the value next to x (6, in this case), divide it by 2, and square it. $(6/2)^2=(3)^2=9$. The constant is 9. The reason we halve the 6 and square it is that we know that in an equation in the form $(x+p)(x+p)$ (which is what we're trying to get to), $px+px=6x$, so $p=6/2$; to get the constant p^2, we thus have to take $6/2$ (our p) and square it. Now, replace the blank space on either side of our equation with the constant 9: $y+3/14+7(9)=7(x^2+6x+9)$ $y+{3/14}+63=7(x^2+6x+9)$ $y+{3/14}+{882/14}=7(x^2+6x+9)$ $y+{885/14}=7(x^2+6x+9)$ Next, factor the equation inside of the parentheses. Because we completed the square, you will be able to factor it as $(x+{\some umber})^2$. $y+{885/14}=7(x+3)^2$ Last step: move the non-y value from the left side of the equation back over to the right side: $y=7(x+3)^2-{885/14}$ Congratulations! You've successfully converted your equation from standard quadratic to vertex form. Now, most problems won't just ask you to convert your equations from standard form to vertex form; they'll want you to actually give the coordinates of the vertex of the parabola. To avoid getting tricked by sign changes, let's write out the general vertex form equation directly above the vertex form equation we just calculated: $y=a(x-h)^2+k$ $y=7(x+3)^2-{885/14}$ And then we can easily find h and k: $-h=3$ $h=-3$ $+k=-{885/14}$ The vertex of this parabola is at coordinates $(-3,-{885/14})$. Whew, that was a lot of shuffling numbers around! Fortunately, converting equations in the other direction (from vertex to standard form) is a lot simpler. How to Convert From Vertex Form to Standard Form Converting equations from their vertex form to the regular quadratic form is a much more straightforward process: all you need to do is multiply out the vertex form. Let's take our example equation from earlier, $y=3(x+4/3)^2-2$. To turn this into standard form, we just expand out the right side of the equation: $$y=3(x+4/3)^2-2$$ $$y=3(x+4/3)(x+4/3)-2$$ $$y=3(x^2+{8/3}x+16/9)-2$$ $$y=3x^2+8x+{16/3}-2$$ $$y=3x^2+8x+{16/3}-{6/3}$$ $$y=3x^2+8x+10/3$$ Tada! You've successfully converted $y=3(x+4/3)^2-2$ to its ax^2+bx+c form. Parabola Vertex Form Practice: Sample Questions To wrap up this exploration of vertex form, we have four example problems and explanations. See if you can solve the problems yourself before reading through the explanations! #1: What is the vertex form of the quadratic equation $x^2+ 2.6x+1.2$? #2: Convert the equation $7y=91x^2-112$ into vertex form. What is the vertex? #3: Given the equation $y=2(x-3/2)^2-9$, what are the x-coordinates of where this equation intersects with the x-axis? #4: Find the vertex of the parabola $y=({1/9}x-6)(x+4)$. Parabola Vertex Form Practice: Solutions #1: What is the vertex form of the quadratic equation ${\bi x^2}+ 2.6\bi x+1.2$? Start by separating out the non-x variable onto the other side of the equation: $y-1.2=x^2+2.6x$ Since our a (as in ax^2+bx+c) in the original equation is equal to 1, we don't need to factor it out of the right side here (although if you want, you can write $y-1.2=1(x^2+2.6x)$). Next, divide the x coefficient (2.6) by 2 and square it, then add the resulting number to both sides of the equation: $(2.6/2)^2=(1.3)^2=1.69$ $y-1.2+1(1.69)=1(x^2+2.6x+1.69)$ Factor the right side of the equation inside the parentheses: $y-1.2+1.69=(x+1.3)^2$ Finally, combine the constants on the left side of the equation, then move them over to the right side. $y-1.2+1.69=(x+1.3)^2$ $y+0.49=(x+1.3)^2$ Our answer is $y=(x+1.3)^2-0.49$. #2: Convert the equation $7\bi y=91\bi x^2-112$ into vertex form. What is the vertex? When converting an equation into vertex form, you want the y have a coefficient of 1, so the first thing we're going to do is divide both sides of this equation by 7: $7y= 91x^2-112$ ${7y}/7= {91x^2}/7-112/7$ $y=13x^2-16$ Next, bring the constant over to the left side of the equation: $y+16=13x^2$ Factor out the coefficient of the x^2 number (the a) from the right side of the equation $y+16=13(x^2)$ Now, normally you'd have to complete the square on the right side of the equation inside of the parentheses. However, x^2 is already a square, so you don't need to do anything besides moving the constant from the left side of the equation back to the right side: $y=13(x^2)-16$. Now to find the vertex: $y=a(x-h)^2+k$ $y=13(x^2)-16$ $-h=0$, so $h=0$ $+k=-16$, so $k=-16$ The vertex of the parabola is at $(0, -16)$. #3: Given the equation $\bi y=2(\bi x-3/2)^2-9$, what is(are) the $\bi x$-coordinate(s) of where this equation intersects with the $\bi x$-axis? Because the question is asking you to find the x-intercept(s) of the equation, the first step is to set $y=0$. $y=0=2(x-3/2)^2-9$. Now, there are a couple of ways to go from here. The sneaky way is to use the fact that there's already a square written into the vertex form equation to our advantage. First, we'll move the constant over to the left side of the equation: $0=2(x-3/2)^2-9$ $9=2(x-3/2)^2$ Next, we'll divide both sides of the equation by 2: $9/2=(x-3/2)^2$ Now, the sneaky part. Take the square root of both sides of the equation: $√(9/2)=√{(x-3/2)^2}$ $±3/{√2}=(x-3/2)$ $±

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