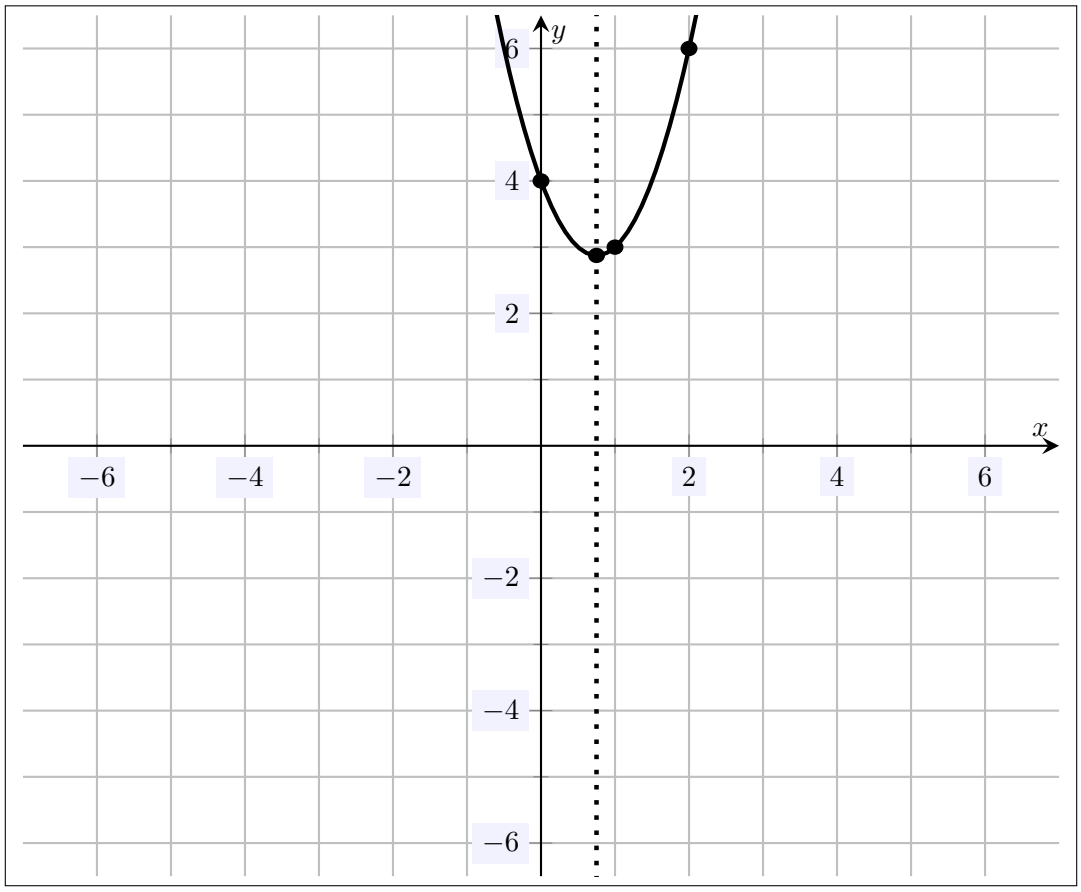
Name: *Caleb McWhorter — Solutions*
MATH 100
Fall 2021
HW 8: Due 10/27

"Cleanliness becomes more important when godliness is unlikely."
–P.J. O'Rourke

Problem 1. (10pt) Plot the quadratic function $y = 2x^2 - 3x + 4$ as accurately as possible. Your sketch should include the vertex and axis of symmetry.



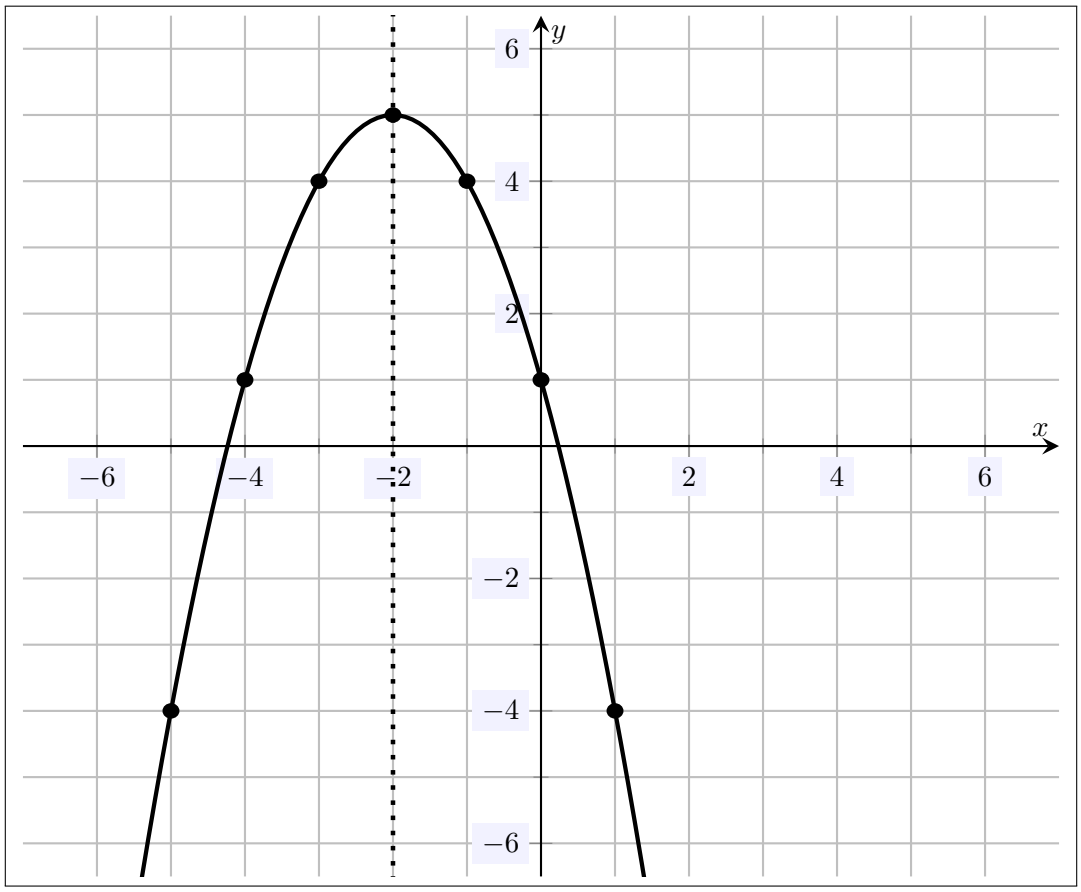
Because $a = 2 > 0$, the parabola opens upwards, i.e. is convex. The vertex occurs at $x = -\frac{b}{2a} = -\frac{-3}{2(2)} = \frac{3}{4}$. We know

$$y(3/4) = 2\left(\frac{3}{4}\right)^2 - 3\left(\frac{3}{4}\right) + 4 = 2 \cdot \frac{9}{16} - \frac{9}{4} + 4 = \frac{9}{8} - \frac{9}{4} + 4 = \frac{9}{8} - \frac{18}{8} + \frac{32}{4} = \frac{9 - 18 + 32}{4} = \frac{23}{8}$$

Therefore, the vertex is $(3/4, 23/8)$. We need to include this point. The axis of symmetry is $x = \frac{3}{4}$. We find serval other points:

x	-4	-3	-2	-1	0	$\frac{3}{4}$	1	2	3	4
$f(x)$	48	31	18	9	4	$\frac{23}{8}$	3	6	13	24

Problem 2. (10pt) Plot the quadratic function $y = -x^2 - 4x + 1$ as accurately as possible. Your sketch should include the vertex and axis of symmetry.



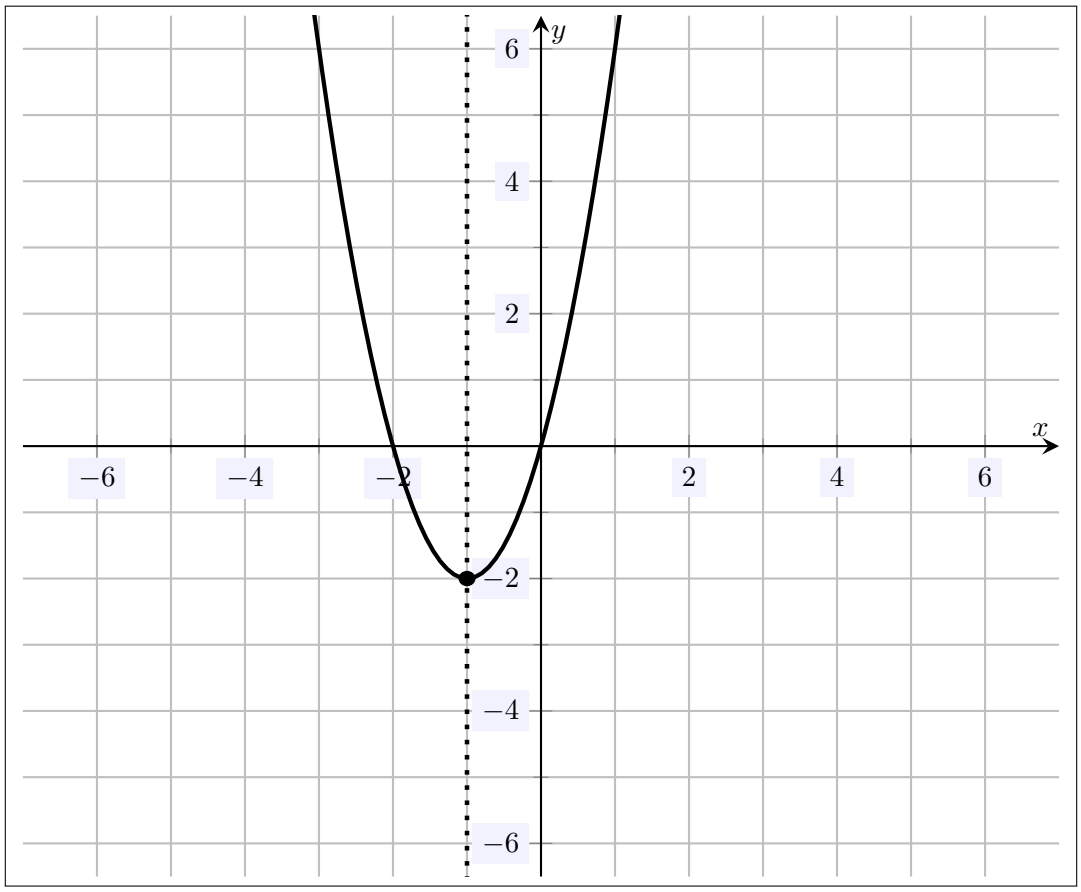
Because $a = -1 < 0$, the parabola opens downwards, i.e. is concave. The vertex occurs at $x = -\frac{b}{2a} = -\frac{-4}{2(-1)} = -2$. We know

$$y(-2) = -(-2)^2 - 4(-2) + 1 = -4 + 8 + 1 = 5$$

Therefore, the vertex is $(-2, 5)$. We need to include this point. The axis of symmetry is $x = -2$. We find serval other points:

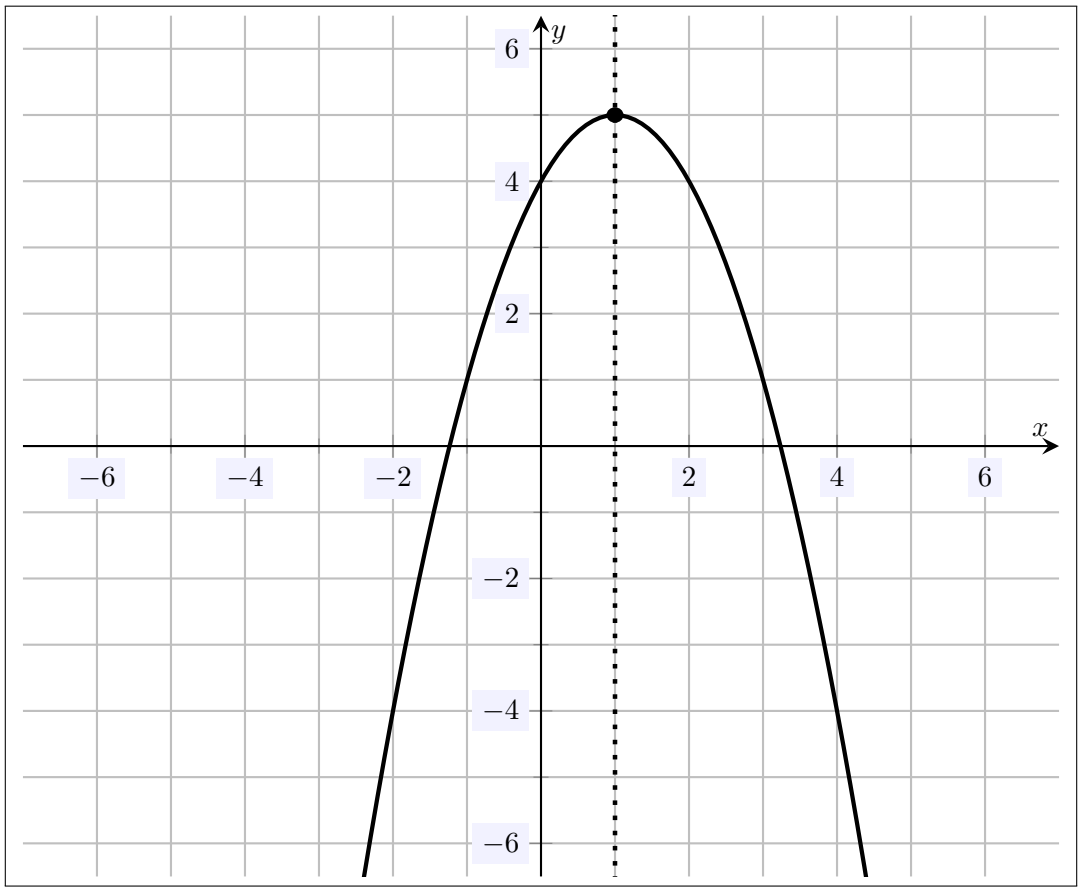
x	-6	-5	-4	-3	-2	-1	0	1	2	3	4
$f(x)$	-11	-4	1	4	5	4	1	-4	-11	-20	-31

Problem 3. (10pt) Give a rough sketch of the quadratic function $y = 2(x+1)^2 - 2$. Your sketch should include the vertex and axis of symmetry.



Because $a = 2 > 0$, the parabola opens upwards, i.e. is convex. Because the parabola is in vertex form, we know the vertex is $(-1, -2)$. Therefore, the axis of symmetry is $x = -1$.

Problem 4. (10pt) Give a rough sketch of the quadratic function $y = 5 - (x - 1)^2$. Your sketch should include the vertex and axis of symmetry.



Because $a = -1 < 0$, the parabola opens downwards, i.e. is concave. Because the parabola is in vertex form, we know the vertex is $(1, 5)$. Therefore, the axis of symmetry is $x = 1$.