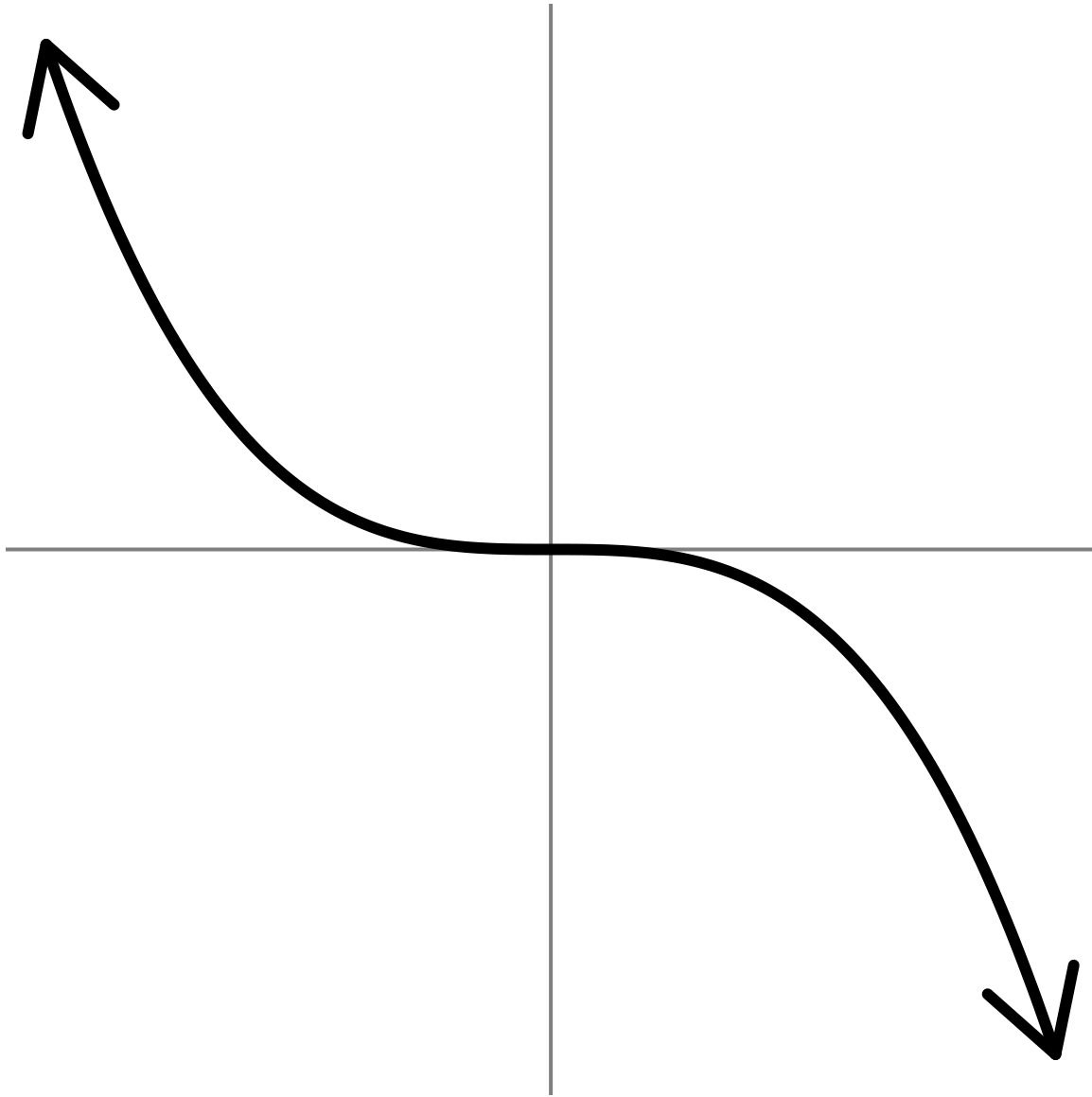# Fusion Academy

1. The degree of the polynomial is 3, which is odd. The highest-degree term's coefficient is negative.

   Thus the end behavior is up-down: when $x \to -\infty$ then $f(x) \to \infty$ and when $x \to \infty$ then $f(x) \to -\infty$.


2. The Fundamental Theorem of Algebra tells us that the number of complex roots, when counting for multiplicity, is equal to the degree of the polynomial.

   The degree of the polynomial is just the largest exponent.

   Here are the (numerically solved, approximate) roots:

```
## -0.89411
## 0
## -0.2763 - 0.85035*i
## -0.2763 + 0.85035*i
## 0.72335 - 0.52555*i
## 0.72335 + 0.52555*i
```

3. You need to consider the roots and end behavior. If a root has even multiplicity, you need to bounce the curve off the x-axis there.
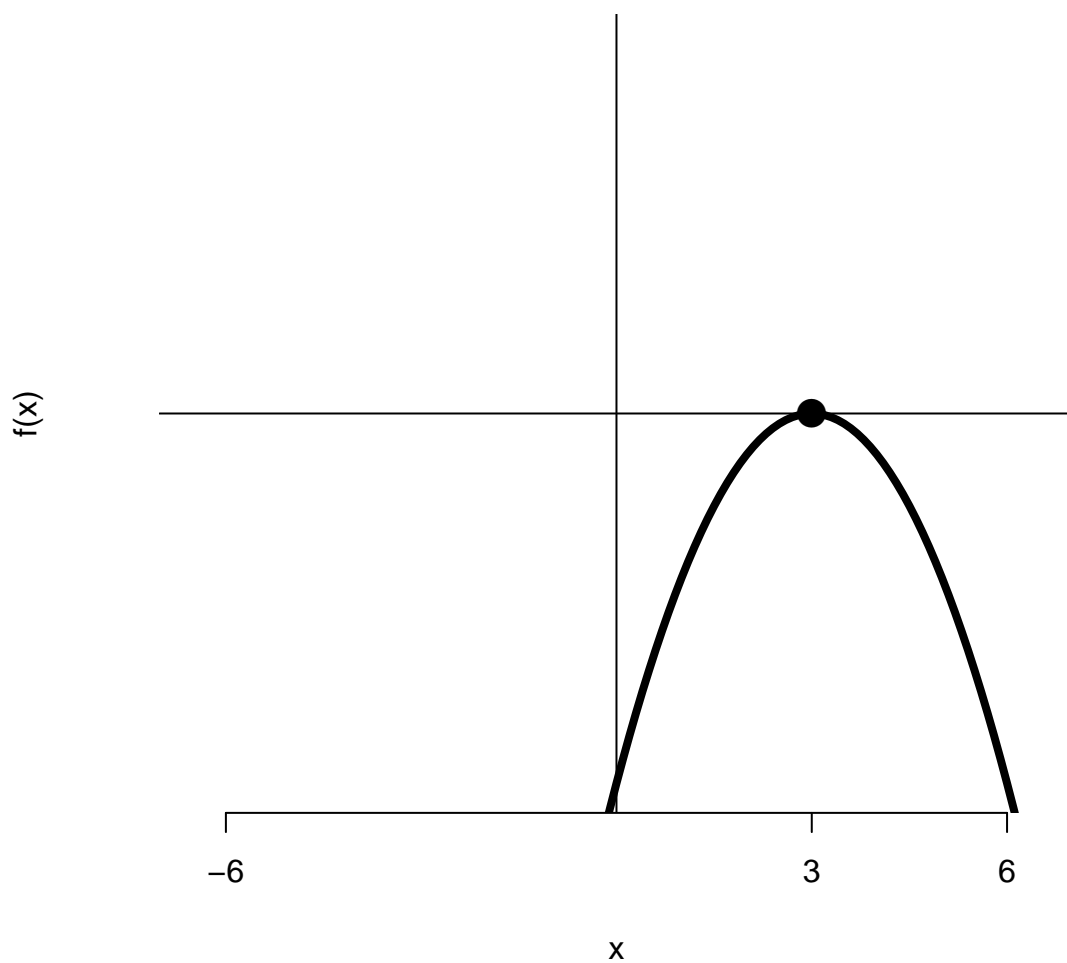
4. Factor.

$$f(x) = (x - 3)(x - 4 - 2i)(x - 4 + 2i)$$

The roots:

$$x|_{f(x)=0} = [3, 4 - 2i, 4 + 2i]$$