Math 241— Attracting, Repelling, and Neutral Fixed Points

Problem 1. For each of the following maps, classify each fixed point x_0 as attracting or repelling by computing $|F'(x_0)|$. Compare this with what you see in a graphical analysis with cobweb plots.

1. $F(x) = x^2$

2. $F(x) = x^3$

3. $F(x) = x^{1/3}$

Problem 2. For each map below, $x_0 = 0$ is a fixed point. Explain why it is a neutral fixed point. Next, look at the behavior of orbits that start near x_0. For one of these maps, we will call x_0 *weakly attracting* since all nearby orbits converge toward x_0. Which one? Which one should we call *weakly repelling*? What happens with the map that is neither weakly attracting nor weakly repelling?

1. $F(x) = x - x^2$

2. $F(x) = x - x^3$

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