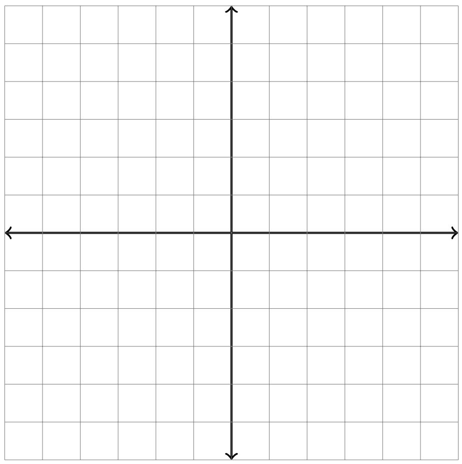
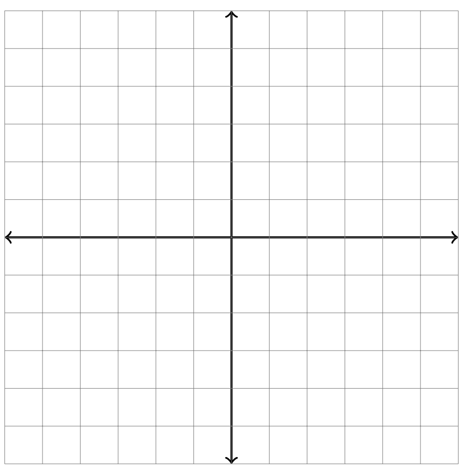
1. Suppose that $f(x)$ is approximated by $-1 + (x-1) + 2(x-1)^2 + (error)$. This is an approximation around $x = 1$. Sketch $f(x)$ near $x = 1$. Do you think $f(x)$ has a local min or max nearby?

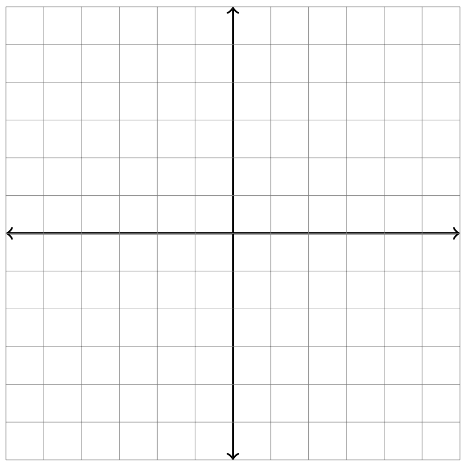


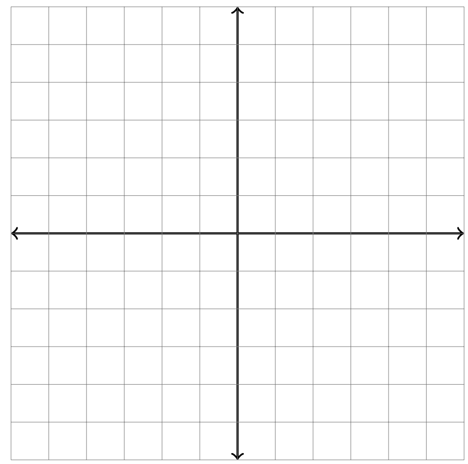
2. Suppose that $f(x)$ is approximated by $2 + 2(x+1)^2 + (error)$. This is an approximation around $x = -1$. Sketch $f(x)$ near $x = -1$. Do you think $f(x)$ has a local min or max nearby?



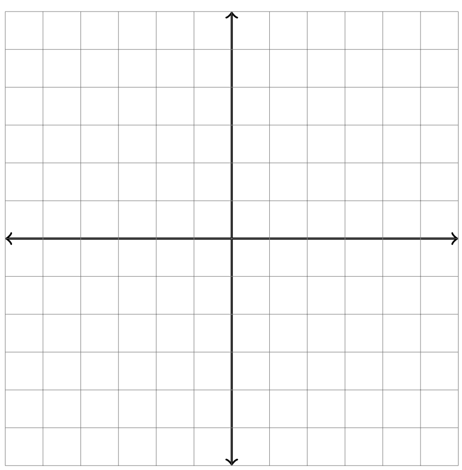
3. Suppose a function has derivative $f'(x) = (x-2)(x-1)$. Where is $f(x)$ increasing or decreasing? Where are the critical points of $f(x)$?

4. Sketch both $3 + x - x^2$ and $3 - x^2$ and compare. If these are approximations to two different functions, which would you guess has a larger maximum near zero?





5. Suppose $f'(x) = 1 - x^2 + (error)$. Estimate the critical points of $f(x)$, then where $f(x)$ is increasing or decreasing. Finally, use this information to sketch $f(x)$ assuming $f(0) = 0$.



6. Identify the critical points of $f(x) = 6x^{1/3} - x$. Write quadratic approximations at each local min or max to determine whether the point is a local min or max (or indeterminate).

7. Identify the critical points of $f(x) = -3x^{1/3} + 2x$. Use the second derivative test to determine whether each is a local min or max (or indeterminate).

8. Compare Questions 6 and 7. Which method do you prefer? Can you think of advantages of both methods? Disadvantages?

9. Suppose you know that $f'(a) = f''(a) = f'''(a) = 0$. Can you state a "degree 4 approximation/fourth derivative test" that could help you determine whether a is a local min or max? Hint: think about the graph of x^4.

10. Comparing to the above, what would happen if you tried to create a "degree 4 approximation/third derivative test" to separate mins from maxes?