MATH 202 **Name:** ______________________________

Calculus Practice III, Fall 2023

Here is an opportunity for you to maintain your calculus skills over the summer. If you complete these problems, digitize your work, and submit your work to Canvas, I will send you my solutions. If you need some help with these questions, email me with your questions (willisb@unk.edu)

Completing this work is optional, and it does not enter into your class grade in any way–this work is not a bonus, extra credit, or anything like that.

1. The graph in Figure 1 shows the graph of a wild and crazy function (the red curve) we'll unimaginatively call F. I've labeled several points on the graph and I drew the tangent to the curve $y = F(x)$ with the point of tangency $(x = 2, y = 5)$ as well.

   (a) As best you can, find the numerical value of $F'(2)$. To do this, as accurately as your eyeballs allow, find the coordinates to two widely separated points on tangent line (the green line) and find its slope using rise over run.

   (b) For the other labeled points $((-3,2),(-1,8)$, and $(1,8))$ follow the same process to approximate the value of $F'(-3), F'(-1)$ and $F'(1)$. You'll need to use a ruler to draw each tangent line.

   (c) As best you can, draw a graph of F'.

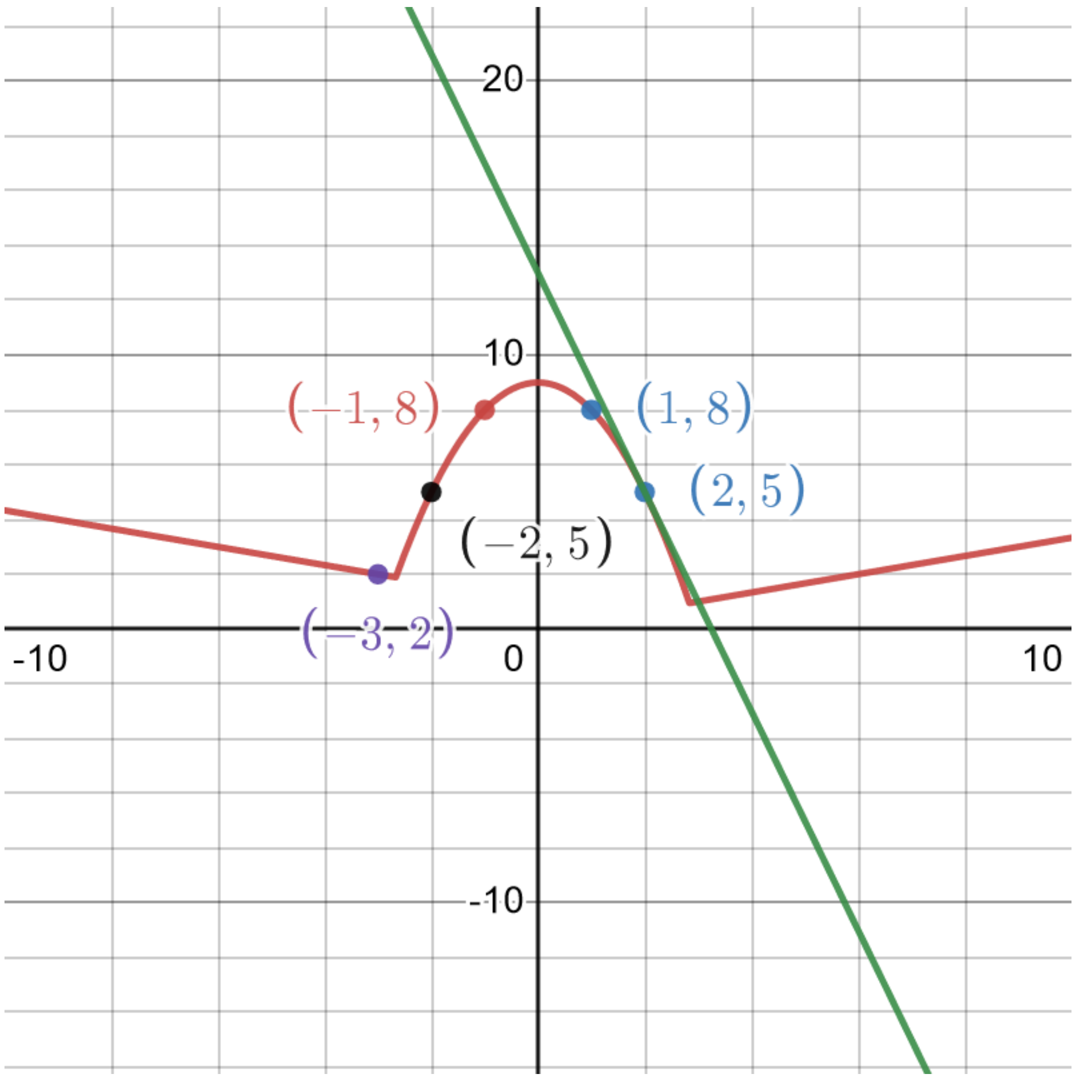
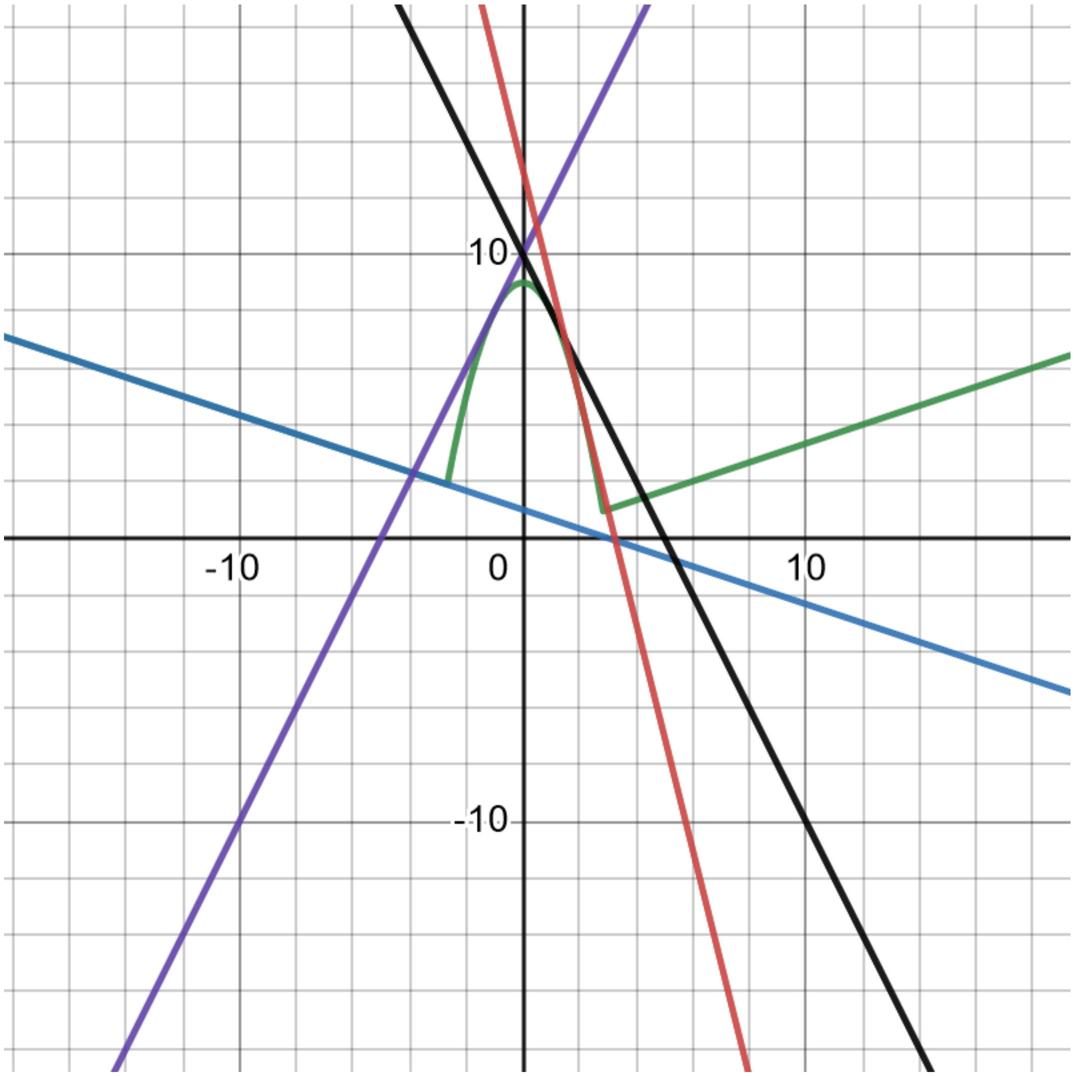


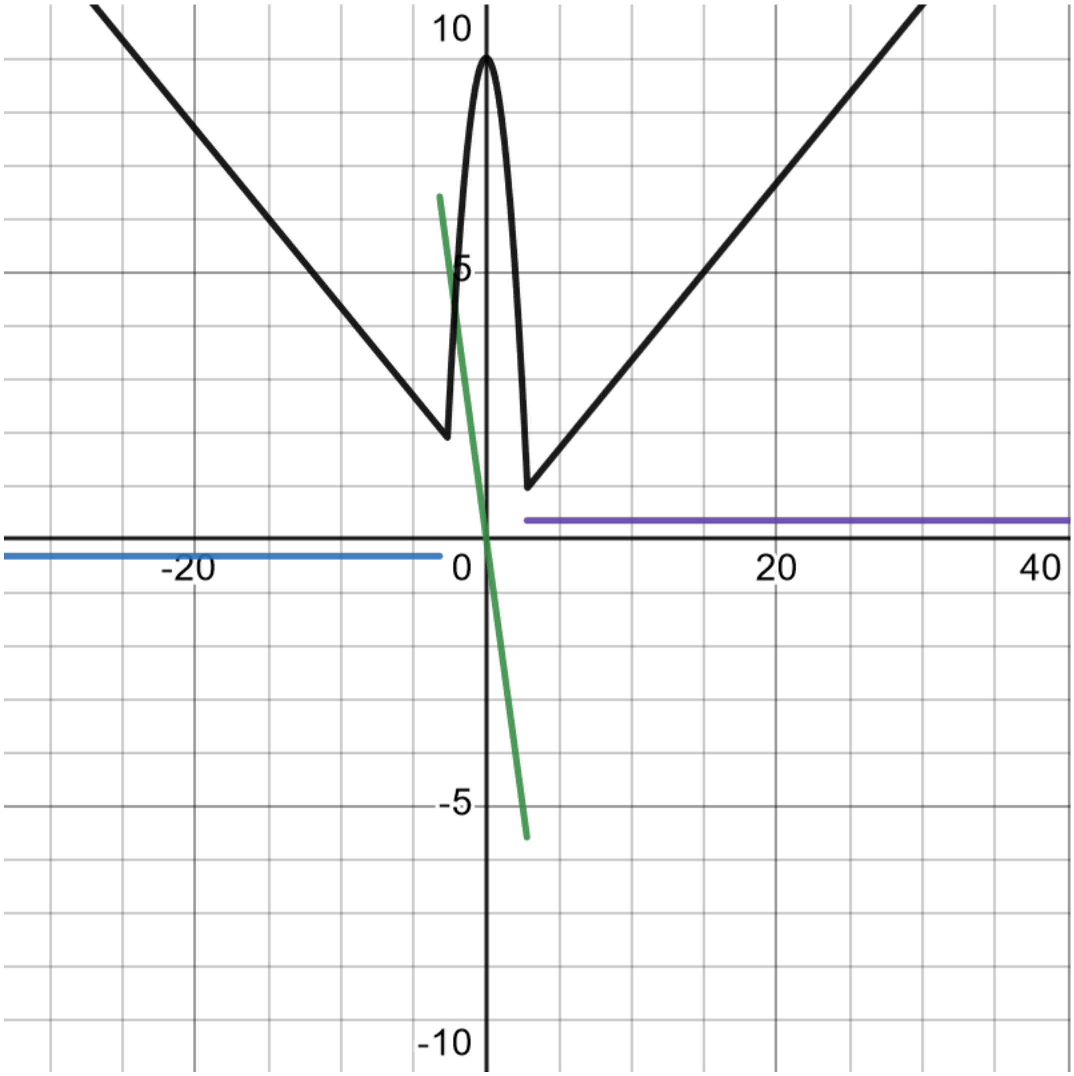
Figure 1: Graph of some wild and crazy function (red curve) along with a graph of its tangent line at $(x = 2, y = 5)$.



As best as my eyeballs are able, we have $F'(-3) = -1/3$, $F'(-1) = 2$, $F'(1) = -2$, and $F'(2) = 4$. The picture is a bit crowded.

To the left of about -3.2, the graph appears to be a line segment with slope $-1/3$; between about -3.2 and 2.8, the graph is a downward facing parabola (so its derivative is a line with negative slope); for x greater than about 2.8, the graph appears to be a line segment with slope 1/3; finally, the graph does not appear to be differentiable at -3.2 and at 2.8. Actually the derivative isn't continuous at these spots either.

So a pretty good graph of both the function and its derivative is


10
5
-5
-10
-20
0
20
40