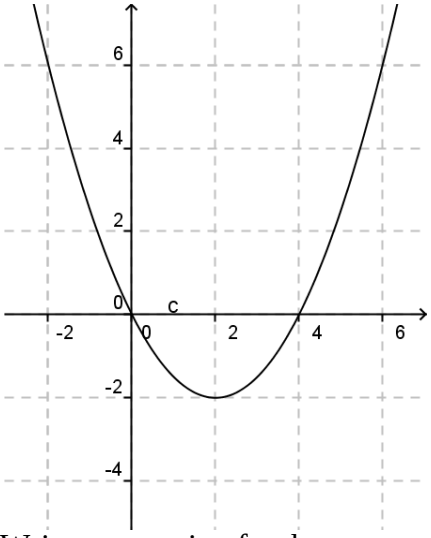
AP Calculus
Graphs of Derivatives Name _____

The derivative of a graph of a function is the _____ of the _____ line at any given point,

and it is represented by the following symbols: _____ or _____.

Problem 1

Given the function f graphed below, answer the following questions about the function and its derivative.



Upon what interval(s) is f increasing? _____

Upon what interval(s) is f decreasing? _____

Does f have any local extrema? If so, where and is it a maximum or minimum?

Draw tangent lines to f at each integral value of x over the interval [-2, 6].

Estimate $f'(-1)$, $f'(2)$, and $f'(4)$.

Write an equation for the tangent line to f at $x = 4$.

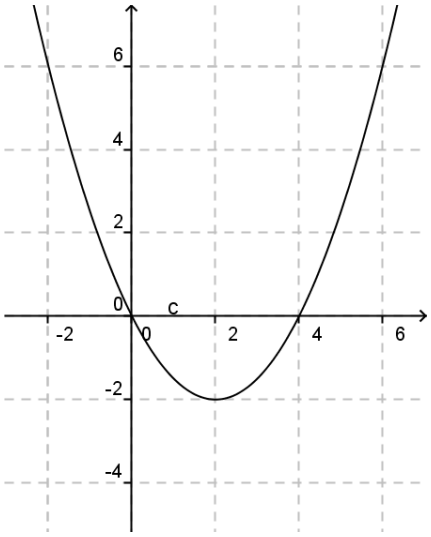
Looking at your tangent lines, determine the intervals where $f' > 0, f' < 0$, and $f' = 0$.

Compare these intervals to your answers to the above questions. What conclusions can be made?

Sketch a graph of f' on the same axes above by using your information from the previous questions.

Problem 2

Given the function f' (the derivative of f) graphed below, answer the following questions about the function f and its derivative.



Upon what interval(s) is $f' > 0$? _____

Upon what interval(s) is $f' < 0$? _____

At what values does $f' = 0$? _____

What does this information imply about the function f?

Estimate $f'(-1)$, $f'(2)$, and $f'(4)$.

Upon what interval(s) is f' increasing? _____

Upon what interval(s) is f' decreasing? _____

At what value(s) does f' have local extrema? _____

Draw tangent lines to f' at each integral value of x over the interval [-2, 6].

Use your tangent lines to estimate the following values: $f''(0)$, $f''(2)$, and $f''(3)$.

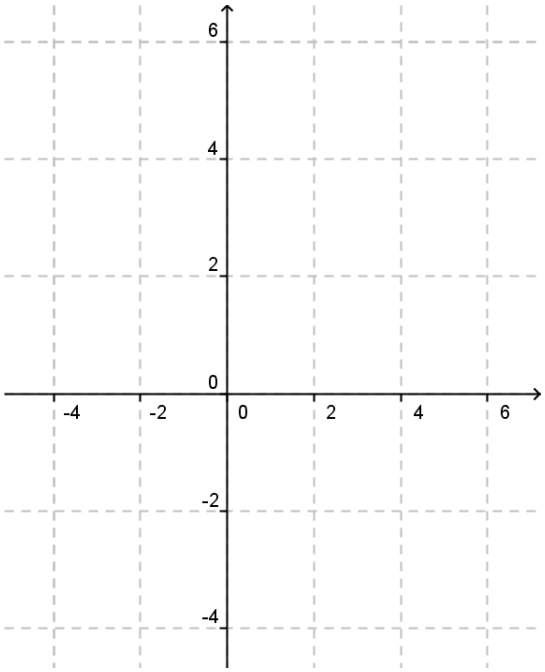
Looking at your tangent lines, determine the intervals where $f'' > 0, f'' < 0$, and $f'' = 0$.

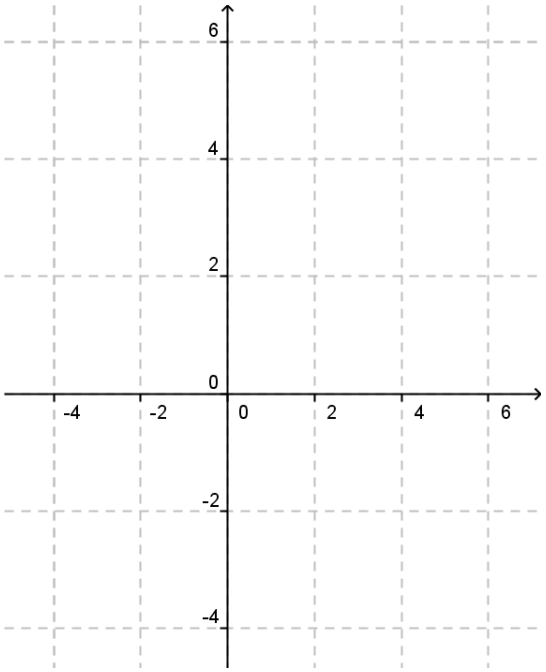
Compare these intervals to your answers to the above questions. What conclusions can be made?

How do these characteristics relate to the concavity of the function f?

Problem 2 (continued)

Sketch a graph of f and f'' on the same axes on the previous page or the axes below by using your information from the previous questions.



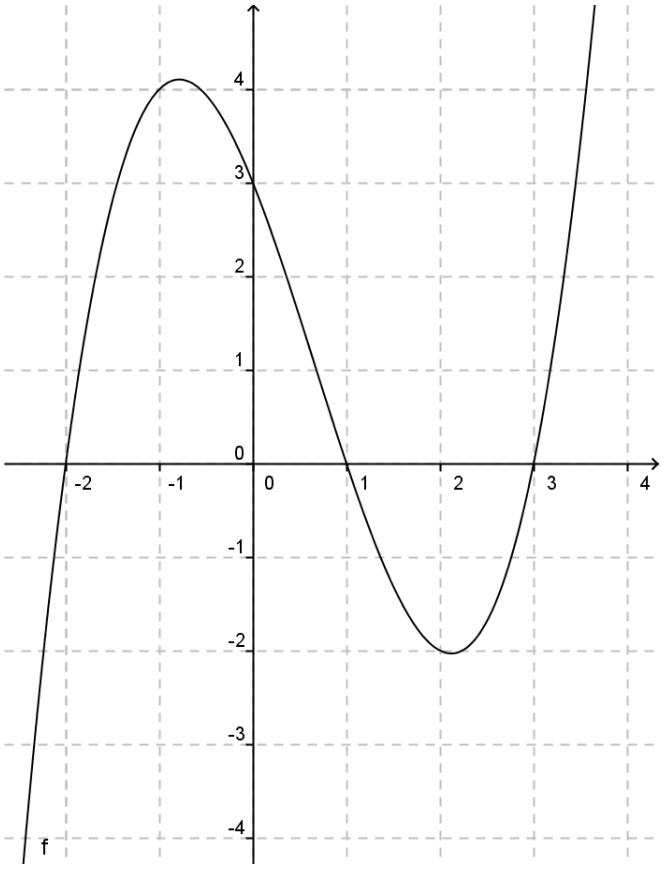


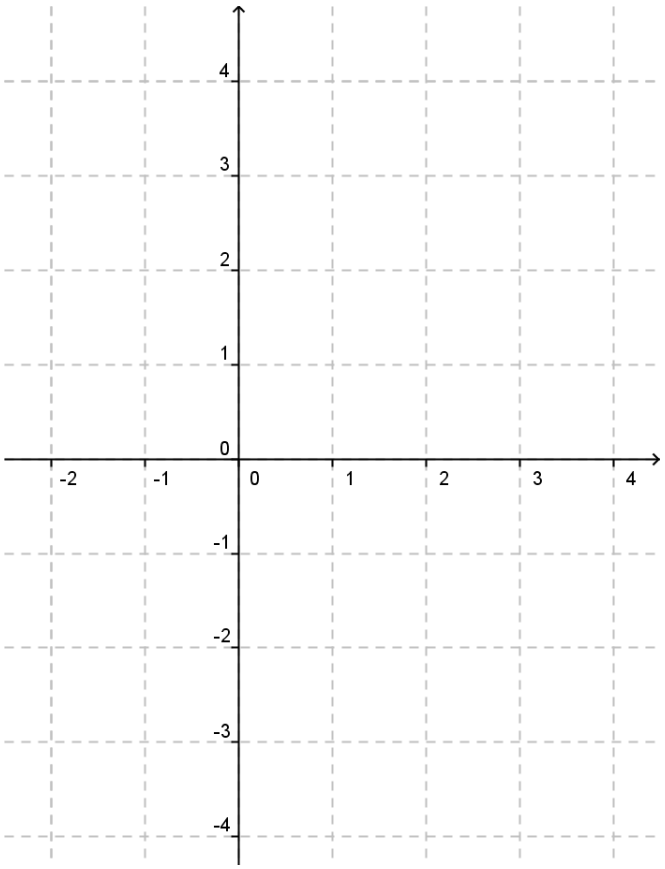
If you compare your sketches of f and f'' to someone else's, will they be exactly alike? Why or why not?

Given that $f(1) = 5$, write an equation of the tangent line to f at $x = 1$.

Problem 3

Using the function f' graphed below, sketch the graphs of f and f''. Explain all of the characteristics that determine what each graph looks like (concavity, increasing/decreasing, local extrema, inflection points, etc.) Use one set of axes for all three or separate your graphs if you wish.





Problem 4

In the following graph, the functions are related by derivatives. Determine which function is f, f', and f''. Explain your reasoning.