

Math 105: Review for Exam I

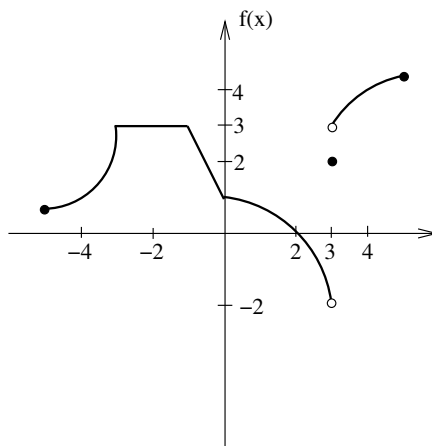
1. Let $f(x) = 3 + \sqrt{x+5}$.

- (a) What is the natural domain of f ?
- (b) What is the range of f ?

2. For the graph of f shown, answer the following.

(a) Evaluate the following.

- i. $f'(-2)$
- ii. $f(3)$
- iii. $\lim_{x \rightarrow 3^-} f(x)$
- iv. $\lim_{x \rightarrow 3^+} f(x)$
- v. $\lim_{x \rightarrow 3} f(x)$
- vi. $\lim_{x \rightarrow 2} f(x)$



- (b) Where is f discontinuous?
- (c) Where does f' fail to exist?

3. Let $f(x) = 3x^2 - 2x$.

(a) Compute the average rate of change of f on the interval $[2, 2.1]$.

(b) Using the limit definition of the derivative, find $f'(x)$.

(c) Find the equation of the tangent line to f at $x = 2$.

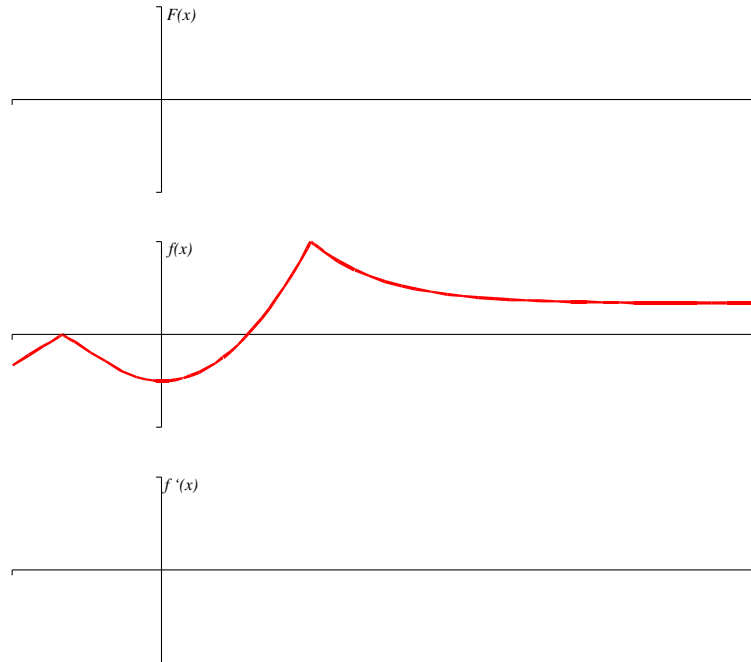
(d) How would the derivative of $g(x) = f(x) + 5$ compare to $f'(x)$?

(e) How would the derivative of $h(x) = 5f(x)$ compare to $f'(x)$?

4. Fill in the table showing the graphical relationships between f , f' , and f'' .

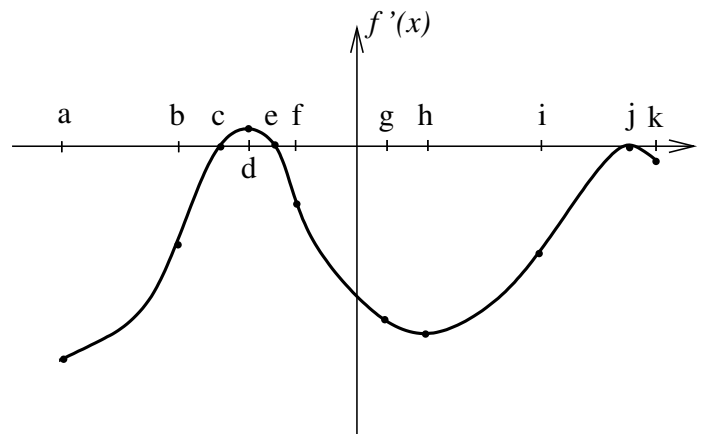
f	positive	negative	increasing	decreasing	concave up	concave down
f'						
f''						

5. Given the graph of f , sketch a graph of f' and a graph of F , an antiderivative of f such that $F(0) = -2$.



6. Shown below is a graph of f' on its entire domain. The graph is NOT f .

- At which x -value(s)
- (a) does f have a stationary point?
 - (b) does f have a local max?
 - (c) does f have a local min?
 - (d) does f' have a stationary point?
 - (e) does f' have a local max?
 - (f) does f' have a local min?
 - (g) is f greatest?
 - (h) is f least?
 - (i) is f' greatest?
 - (j) is f' least?
 - (k) is f'' greatest?
 - (l) is f'' least?
- (b) f decreasing?
 - (c) f' increasing?
 - (d) f' decreasing?
 - (e) f concave up?
 - (f) f concave down?



- On what interval(s) is
- (a) f increasing?

7. Suppose that $T(t)$ gives the temperature in Lewiston as a function of time. In each of the following situations, determine if the signs of T , T' , and T'' are positive, negative, zero, or unknown.

(a) The temperature is 60 degrees and falling steadily.

(b) The temperature is rising more and more slowly.

(c) The temperature is -5 degrees and rising.

8. The table below gives some values for a function $f(x)$ whose derivative exists at all x .

x	0.8	0.9	1.0	1.1	1.2
$f(x)$	5.0	6.2	7.3	8.2	9.0

(a) Estimate $f'(1.05)$.

(b) Based on the data, is $f''(1.0)$ positive or negative?

9. Find the derivatives of the following.

(a) $y = 2 + 3x + x^4 + 5x^6$

(b) $y = \sqrt[6]{x} + \frac{1}{x^6} + \frac{x}{6} + \frac{6}{x} + \frac{\pi}{6} + 6^{1/2}$

10. Find antiderivatives of the following.

(a) $y = \pi + 3x^2$

(b) $y = 4x^5 - \frac{1}{x^6}$

11. Is $y = 5x^3$ a solution to the differential equation $xy' - 3y = 0$? [Students in the 8:00 and 9:30 sections may omit this problem.]

12. Solve the IVP (initial value problem) $1 = x^3 - y'(x)$ if $y(2) = 13$. [Students in the 8:00 and 9:30 sections may omit this problem.]