

Math 105A/B
Exam 1
October 3, 2104
Mr. Balcomb

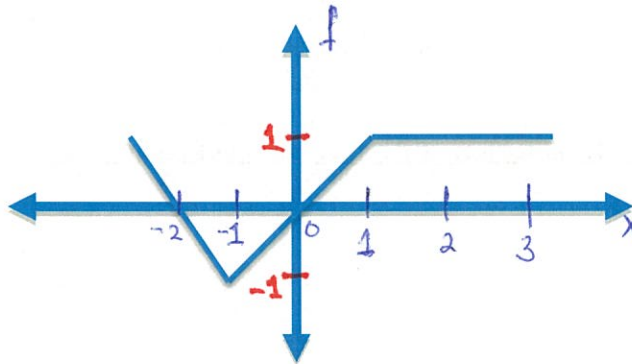
Please show your work.

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

a) What is the domain of f ?

b) What is the range of f ?

2. Use the graph of f shown below to answer the questions.



a) $f'(0)$

b) $f'(-1)$

c) $\lim_{x \rightarrow -1^-} f(x)$

c) $\lim_{x \rightarrow -1^+} f(x)$

3. Let $g(x) = 2x^2 + x$.

a) Compute the average rate of change of g on the interval $[1, 1.2]$.

b) Using the **definition** of the derivative, find $g'(x)$.

c) Find the equation of the tangent line to g at $x = 1$.

$\frac{d}{dx}$

d) How would the derivative of $h(x) = g(x) + 3$ compare to $g'(x)$?

e) How would the derivative of $h(x) = 4g(x)$ compare to $g'(x)$?

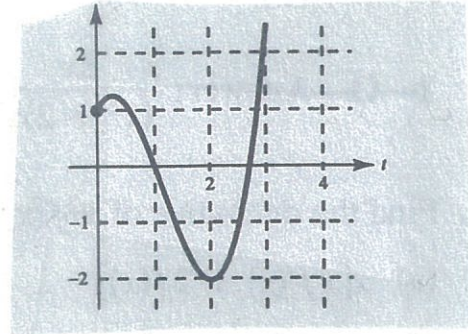
4. The position, $p(t)$ (measured in inches), at any time t (measured in seconds), of an object is described in the graph. Use the graph to determine:

a) $p(0)$

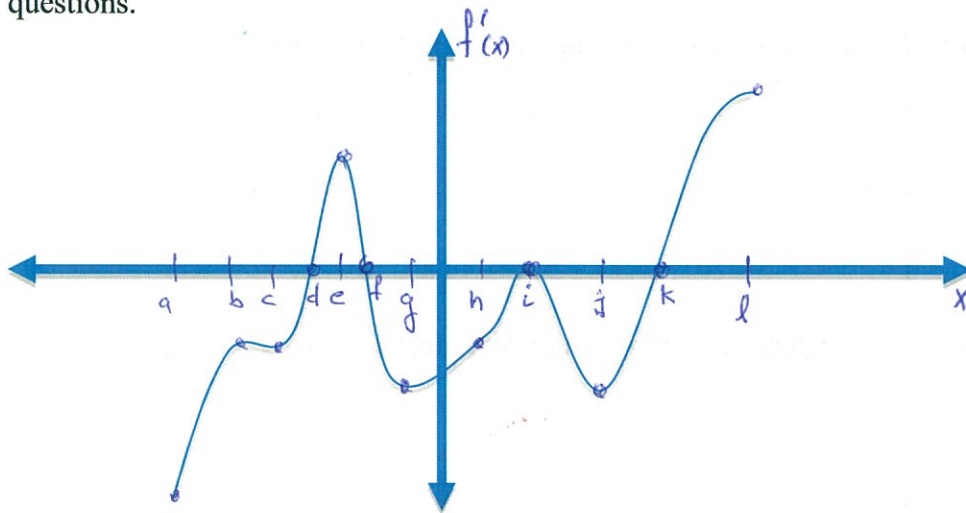
b) $p(1)$

c) $v(2)$

d) Is $v(1) > 0$?



5. The graph shown below is of the **derivative** of f , f' , on its entire domain. Remember that the graph is **NOT** f . Use the given graph to answer the following questions.



a) At which x -value(s) does f have a stationary point?

b) For each stationary point in part (a), classify it as a local maximum, local minimum, or a terrace point (neither).

c) Where is f' smallest?

d) Where is f'' smallest?

6. 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' , T'' are positive, negative, zero, or unknown.

a) The temperature is 70 degrees and is falling steadily.

T

T'

T''

b) The temperature is rising more and more slowly.

T

T'

T''

c) The temperature is 75 degrees and rising.

T

T'

T''

7. Is $y = \sin(x)$ a solution to the differential equation $y' + y = 0$? Justify your answer.

8. Find the derivatives of the following functions.

a) $y = 3x^4 + 5x + 3$

b) $f(x) = \sqrt[3]{x} + \frac{2}{x^2}$

9. Find the **antiderivatives** of the following functions.

a) $y = 2 - x^3$

b) $g(x) = 5x^2 + \frac{1}{x^2}$

10. An object is thrown (straight up) from the top of a 100-foot building ($p(0) = 100$) with an initial velocity of 5 ft/sec ($v(0) = 26$). The acceleration due to gravity is -32 ft/sec².

a) What is the velocity function?

b) What is the position function?

11. An open box is to be made from a square piece of cardboard, 10 inches by 10 inches, by cutting equal squares from each corner and folding up the sides.

a) Sketch a blueprint for the box.

b) Express the volume, V , as a function of the edge of the square, x , cut from each corner.

c) **Using calculus**, find the size of the square that should be cut from each corner such that the volume of the box will be maximized. Be sure to justify that you have found a maximum.