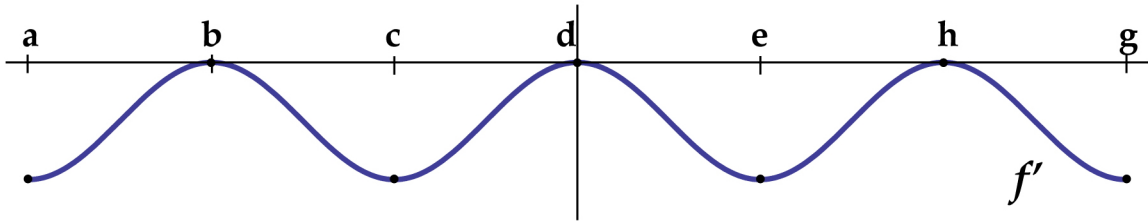




4. (12 pts) Consider the graph of  $f'$ , NOT  $f$ , provided below.



- (a) On what interval(s) is  $f$  increasing?
- (b) At which labeled point(s) is  $f$  greatest?
- (c) At which labeled point(s) is  $f$  least?
- (d) At which labeled point(s) does  $f$  have a local minimum?

5. (13 pts) Use the limit definition of the derivative to find  $f'(0)$  when  $f(x) = \sqrt{x+1}$ .

6. (20 pts) Consider  $f(x) = \begin{cases} x^2 + 2, & \text{if } x < 0 \\ \frac{2x - 2}{x - 1}, & \text{if } x \geq 0 \end{cases}$

Determine the following values (if they exist)

(a)  $\lim_{x \rightarrow 0^-} f(x)$

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

(b)  $\lim_{x \rightarrow 0^+} f(x)$

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

(c)  $f(0)$

(g)  $\lim_{x \rightarrow 1} f(x)$

(d)  $\lim_{x \rightarrow 2} f(x)$

(h)  $f(1)$

(i) Is  $f$  continuous at  $x = 0$ ? Explain your answer using limits.

(j) Is  $f$  continuous at  $x = 1$ ? Explain your answer using limits.

(k) Does  $f'(0)$  exist? Explain your answer.

(l) Does  $f'(1)$  exist? Explain your answer.

7. (15 pts) Imagine that you are on the surface of Mars throwing a rock straight up in the air. The rock is released at a height of 1.5 meters with an initial velocity of 27.5 m/sec. On Mars, the acceleration due to gravity is approximately  $3.72 \text{ m/sec}^2$ . What is the maximum height the rock will go?

8. (10 pts) Find the equation of the line tangent to the graph of  $f(x) = 4x^3 - 3x^2$  at  $x = 1$ .