

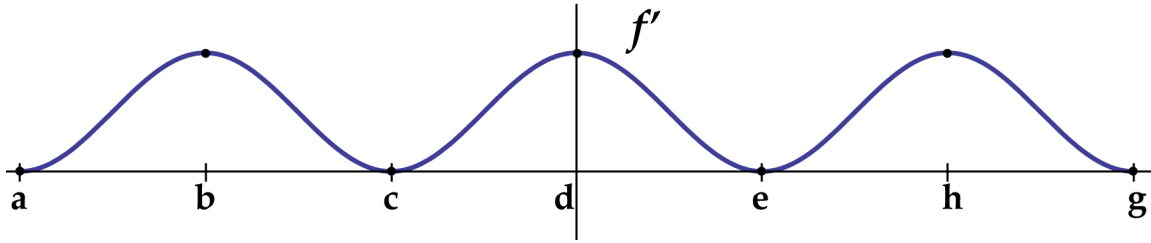
Read directions carefully and show all your work. Partial credit will be assigned based upon the correctness, completeness, and clarity of your answers. Correct answers without proper justification or those that use unapproved short-cut methods will not receive full credit.

1. (10 pts) What is the domain of $f(x) = \frac{\sqrt{x}}{(x+1)(x-2)}$?

2. (10 pts) Use algebraic methods to determine if the function $f(x) = x^5 - 3x^3 + x$ is even, odd, or neither?

3. (10 pts) Consider a function f with second derivative $f''(x) = (4x^4 + 6x^2)e^{x^2}$.
Is $x = 0$ an inflection point for f ? Justify your answer.

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 maximum?

5. (13 pts) Use the limit definition of the derivative to find $f'(0)$ when $f(x) = \frac{2}{x+1}$.

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

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 the moon throwing a rock straight up in the air. The rock is released at a height of 1.5 meters with an initial velocity of 25 m/sec. On the moon, the acceleration due to gravity is approximately 1.62 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 $f(x) = 2\sqrt{x} + 3x$ at $x = 1$.