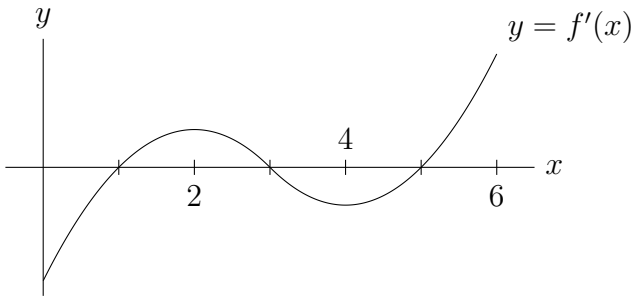
Calculus

Instructions Please write your name in the upper right-hand corner of the page. Write complete sentences to explain your solutions.

1. Suppose $f(x) = \dfrac{\cos x}{2 + \sin x}$. Find the absolute maximum value of this function for x in the closed interval $[0, 2\pi]$.
   [This is exercise 50 on page 313 of the textbook.]

2. The graph below shows the *derivative* $f'(x)$ on the open interval $(0, 6)$. Determine the values of x for which the graph of the *original function* $f(x)$ [not shown] has (a) local minima and (b) inflection points.



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3. Suppose f is a function that has derivatives of all orders. If $f(0) = 0$ and $f'(0) = 2$, compute the limit $\lim_{x \to 0} \dfrac{f(x)\sin(3x)}{1 - e^{x^2}}$.

4. Sketch the graph of a function f that satisfies all of the following conditions.

   - Conditions on the function: $f(-1) = 4$ and $f(1) = 0$.
   - Conditions on the derivative: $f'(-1) = 0$ and $f'(1)$ does not exist.
   - Additional conditions on the derivative: $f'(x) < 0$ if $|x| < 1$ and $f'(x) > 0$ if $|x| > 1$.
   - Condition on the second derivative: $f''(x) < 0$ if $x \neq 1$.

   [This is exercise 16 on page 306 of the textbook.]