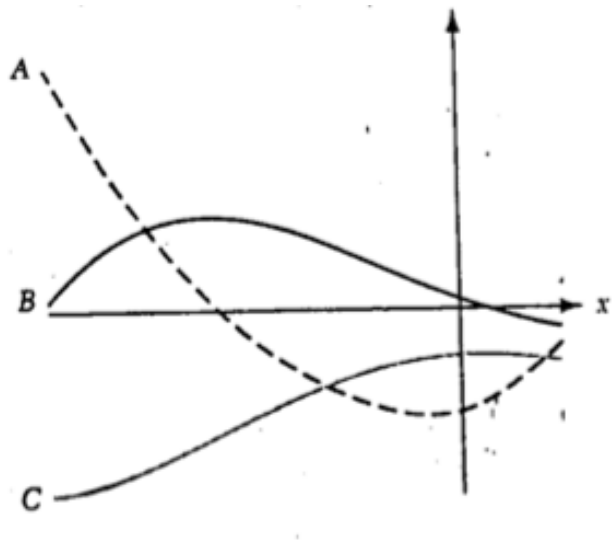
(Mostly) From Yesterday

1. Let $f(x) = 3x^2 + 4$. Use an algebraic definition of the derivative (a difference quotient) to compute $f'(x)$. Be sure to show all your work.

2. Find the functions.

   Graphs A, B and C can be seen as $f(x), f'(x)$, and $f''(x)$. Which is which? Explain.



3. $f(x)$ even and differentiable $\implies$ $f'(x)$ odd

   Consider why this statement is true by looking at the geometry behind the $h \to 0$ difference quotient. Draw a good diagram labeling the relevant points. [Hint: Start with just two points in the first quadrant.]

4. What is a *logarithm*? Use the equation $a = \log_b c$ to setup a definition.

5. Consider a function $f(x)$, defined on the reals such that $f(x) = x^2$ for irrational values of x, and $f(x) = 4$ for rational values of x. Discuss the continuity of $f(x)$.

6. Assume $g(7) = 5$ and $g'(7) = 4$. Write an equation (in Taylor form) for $t(x)$, the line tangent to $g(x)$ at $x = 7$.

New Questions

7. Recall "the limit of a sum is the sum of the limits"
   (a) What does this statement mean?
   (b) Show how to use a difference quotient to proof that:
   $$\text{if } h(x) = f(x) + g(x) \text{ then } h'(x) = f'(x) + g'(x)$$
   (c) State this result in English.

8. Show how to use a difference quotient to proof that:
   $$\text{if } l(x) = k \cdot f(x) \text{ and } k \text{ is a constant, then } l'(x) = k \cdot f'(x)$$
   State this result in English.

9. Use our definition of a log to show
   $$\log_b a \equiv \frac{\log_c a}{\log_c b}$$
   .