Monday Night Calculus

The Fundamental Theorem of Calculus

11/30 Question

1. Suppose the function g is defined by $g(x) = \int_2^x 2^{-t^2}\, dt$.

(a) Find an equation of the line tangent to the graph of g at $x = 2$.

(b) Let $h(x) = g(\sqrt{x})$. Find $h(4)$, $h'(4)$, and $h''(4)$.

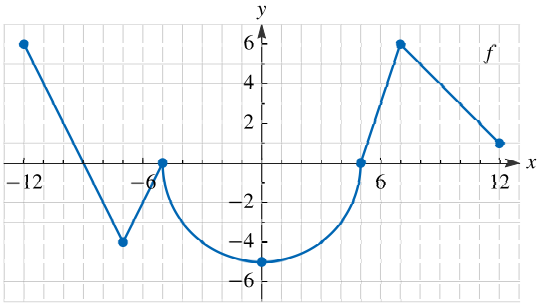
2. Let k be the function defined by $k(x) = \int_{\sin x}^{\cos x} t\, dt$.

(a) Find $k(0)$ and $k\left(\frac{\pi}{4}\right)$.

(b) Use the Fundamental Theorem of Calculus Part 1 to find $k'(x)$.

(c) Use the Fundamental Theorem of Calculus Part 2 to show that $k(x) = \frac{1}{2}\cos(2x)$.

3. Let g be the function defined by $g(x) = \int_5^x f(t)\, dt$ where f is the function whose graph is shown in the figure.



(a) Find $g(12)$ and $g(-5)$.

(b) Find the maximum value of g on the closed interval $[-12, 12]$.

(c) Find an equation of the line tangent to the graph of g at $x = 7$, or explain why the tangent line does not exist.

(d) Let $h(x) = g(x^2)$. Find $h'(-3)$.

(e) Let $k(x) = g(x)^2$. Find $k'(9)$.