If \( f \) is a continuous function on \([a, b]\), then the function \( g(x) \) defined by
\[
g(x) = \int_{a}^{x} f(t) \, dt
\]
is continuous and differentiable and \( g'(x) = f(x) \).

1. Let \( g(x) = \int_{0}^{x} f(t) \, dt \) where \( f \) is the function whose graph is shown.
   a. Evaluate \( g(0), g(1), g(2), g(3), g(5), g(6), g(7), g(9) \)
   b. On what interval is \( g(x) \) increasing?
   c. Where does \( g(x) \) have a maximum value?
   d. Sketch a rough graph of \( g(x) \).

2. Let \( g(x) = \int_{-3}^{x} f(t) \, dt \), where \( f \) is the function whose graph is shown.
   a. Evaluate \( g(-3), and g(3) \)
   b. Estimate \( g(-2), g(-1), g(0) \)
   c. Where does \( g(x) \) have a maximum value?
   d. Sketch a rough graph of \( g(x) \).
Use Part 1 of the Fundamental Theorem of Calculus to find the derivative of these functions.

1. \( g(x) = \int_{1}^{x} \ln t \, dt \) 

2. \( g(u) = \int_{-x^2 + x}^{u} \frac{1}{t} \, dt \)

3. \( F(x) = \int_{x}^{\frac{\pi}{2}} \tan \theta \, d\theta \)

4. \( h(x) = \int_{0}^{\frac{x^2}{2}} \sqrt{1 + r^2} \, dr \)

5. Find the interval on which the curve \( F(x) = \int_{0}^{x} \frac{1}{\sqrt{1 + t^2}} \, dt \) is concave upward.

   \( \text{when is } F''(x) \text{ positive?} \)