2. [9 points] Consider the function \( g(t) \), whose graph is shown below, which satisfies 
\[
0 < g(t) \leq \frac{1}{\sqrt{1+t^p}} \quad \text{for } t > 1.
\]

\[ \hspace{1cm} \]

a. [4 points] Find a formula for the antiderivative \( f(t) \) of \( g(t) \) satisfying \( f(1) = 2 \).

\[ Solution: \quad f(t) = 2 + \int_{1}^{t} g(x) \, dx \]

b. [2 points] For which values of \( t \geq 0 \) is \( f(t) \) increasing?

\[ Solution: \quad 1 \leq t \leq \infty \]

c. [2 points] For which values of \( t \geq 0 \) is \( f(t) \) concave up?

\[ Solution: \quad 0 \leq t \leq 2 \]

d. [1 point] For which values of \( p \) is the limit \( \lim_{t \to \infty} f(t) \) guaranteed to exist?

\[ Solution: \quad p > 2 \]