

Calculus Worksheet: Functions Defined by Integrals (1)

Let

$$F(x) = \int_0^x \frac{-5}{2+e^t} dt$$

a) Find  $F'(0)$

$$F'(x) = \frac{-5}{2+e^x}$$

$$F'(0) = \frac{-5}{2+e^0} = \frac{-5}{3}$$

b) Prove that  $F(3) > F(10)$

$$F'(x) = \frac{-5}{2+e^x} \text{ and is always negative}$$

hence  $F$  is a decreasing function. Therefore  $F(3) > F(10)$

c) Is function  $F$  concave up or down?

$$F''(x) = \frac{5 \cdot e^x}{(2+e^x)^2} > 0$$

$F''(x)$  is always positive hence  
 $F$  is concave up.