

1. CHAPTER 6 SECTION 4: SECOND FUNDAMENTAL THEOREM OF CALCULUS

**Theorem 1.1** (The Second Fundamental Theorem of Calculus ). *Assume  $f$  is continuous on  $[a, b]$ . Then the function  $g$  defined by  $g(x) = \int_a^x f(t) dt$  is differentiable on  $(a, b)$  and  $g'(x) = \underline{\hspace{2cm}}$ .*

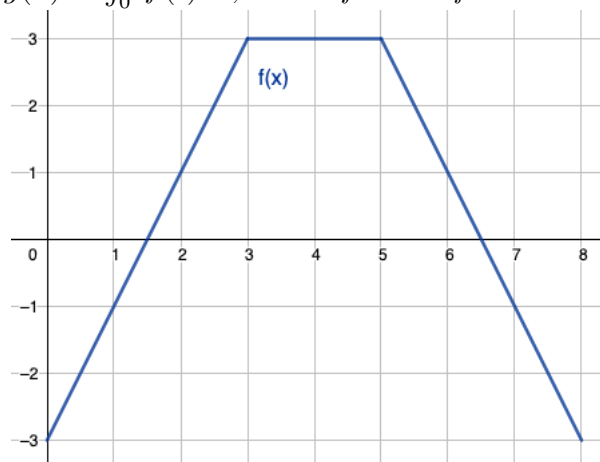
**Example 1.1.** *Suppose  $f'(x) = \cos(x^2)$  and  $f(0) = 3$ . Write an expression for  $f(x)$ .*

**Example 1.2.** *Find  $\frac{d}{dx} \int_1^x \cos(t^2) dt$ .*

**Example 1.3.** *Find  $\frac{d}{dx} \int_1^{x^4} \cos(t^2) dt$ .*

**Example 1.4.** *Find  $\frac{d}{dx} \int_{-x^4}^{x^4} \cos(t^2) dt$ .*

**Example 1.5.** Let  $g(x) = \int_0^x f(t) dt$ , where  $f$  is the function whose graph is shown.



Find the following.

(1)  $g(1.5)$

(2)  $g'(1.5)$

(3)  $g(3)$

(4)  $g'(3)$

(5) Where is  $g'(x) = 0$ ?

(6) Where is  $g$  increasing?

(7) Where do local extrema occur?