

## Extensions of FTC

p. 377 - 383 (5.4)

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Some applications of  $\int_a^b (f(x)) dx = F(b) - F(a)$  include:

1. Area - Find a constant,  $k$ , when the area under the curve is known.
2. Accumulation - Integrate rates of change such as:

$$\int_{t_1}^{t_2} (P'(t)) dt = P(t_2) - P(t_1) \quad \text{population rate of plants, people, animals}$$

$$\int_{t_1}^{t_2} (R'(t)) dt = R(t_2) - R(t_1) \quad \text{flow rate of water, sand, traffic, etc.}$$

3. Terminal Value - Finding  $F(b)$ , the terminal value, when given the initial value,  $F(a)$ . That is,  $F(b) = F(a) + \int_a^b (f(x)) dx$

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\*\*1. If  $\int_{(-2)}^2 (x^7 + k) dx = 16$ , then  $k =$

\*\* (FR) 2. A metal wire of length 8 cm is heated at one end. The table gives selected values of the temperature  $T(x)$ , in  $^{\circ}\text{C}$ , of the wire  $x$  cm from the heated end. Find  $\int_0^8 (T'(x)) dx$  and indicate units of measure. Explain the meaning in terms of the temperature of the wire.

|              |     |    |    |    |    |
|--------------|-----|----|----|----|----|
| Dist. $x$    | 0   | 1  | 5  | 6  | 8  |
| Temp. $T(x)$ | 100 | 93 | 70 | 62 | 55 |

\*\*calc(FR) 3. A particle moves along the  $y$ -axis so that  $v(t) = t \sin(t^2)$  for  $t \geq 0$ . Given that  $s(t)$  is the position of the particle and that  $s(0) = 3$ , find  $s(2)$ .