MATH 16020 Lesson 2: Integration by Substitution III

Spring 2021

Example 1. Suppose the height of an alien plant increases at the rate:

$$H'(t) = \frac{1}{\sqrt{t}\sqrt[3]{(1+\sqrt{t})}} \text{ cm/hour}$$

for t in hours since 6:00 AM. How tall does the plant grow from 7:00AM to 3:00PM? Round answer to 3 decimal places.

Example 2. Suppose now this plant grows at the rate:

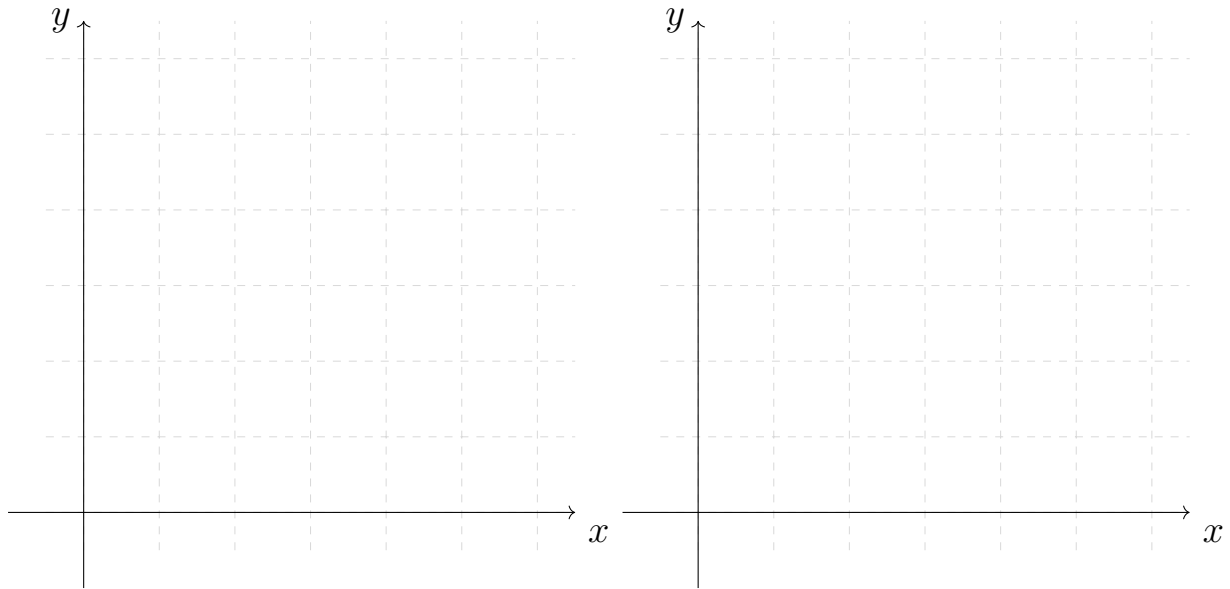$$H'(t) = \frac{1}{\sqrt{t}\sqrt[3]{(1+\sqrt{t})}} \text{ cm/hour}$$

t hours after it was planted. How tall does the plant grow during the third hour? Round answer to 3 decimal places.

Example 3. Suppose as a particle slows down, its velocity is:

$$v(t) = 2e^{1-t} - 1 \text{ cm/s}$$

If the particle starts slowing down at time $t = 0$ seconds, find the distance it takes for the particle to stop.

Definition. For $f(x)$ defined on $[a,b]$, the **average value of $f(x)$ on** $[a,b]$ is:

Example 4. Find the average value of $f(x) = 6x^2 + 2$ over $[1,3]$.

Example 5. Suppose another alien plant is shrinking at the rate of:

$$H'(t) = -100e^{-5t} \text{ cm/min}$$

If the plant has an initial recorded height of 300 cm, find the average height of the plant 4 minutes after this initial recording. Round answer to 3 decimal places.