

Waffle House Calculus

(Samuel Bradshaw, P5)

1) Waffle House sells waffles at a rate roughly represented by the following graph:

$$r(t) = .5\cos t + 12 \quad (t \text{ is in hours})$$

a) How many waffles do they sell from 6:00 AM to 7:00 PM, to the nearest waffle?

Solution:

We assign 6:00 AM the value $t=0$, therefore $t=13$ at 7:00 PM. These are the bounds.

$$\int_a^b r(t) dt = \int_0^{13} (.5\cos t + 12) dt = (.5\sin t + 12t) \Big|_0^{13} = (.5\sin 13 + 156) - 0 \approx 156$$

There are about 156 waffles sold from 6:00 AM to 7:00 PM.

b) What is the average rate of waffles being sold from 6:00 AM to 7:00 PM? Round your answer to the nearest waffle.

Solution:

$$r(t)_{avg} = \frac{1}{b-a} \int_a^b r(t) dt = \frac{1}{13-0} \int_0^{13} (.5\cos t + 12) dt = \frac{1}{13}(156) = 12$$

There is an average of about 12 waffles sold every hour from 6:00 AM to 7:00 PM.

c) Find an equation for $s(t)$, the approximate amount sold in any hour t , if $s(0) = 0$.

Solution:

$$s(t) = \int r(t) dt = \int (.5\cos t + 12) dt = .5\sin t + 12t + C$$

$$s(0) = 0, \text{ therefore } s(0) = .5\sin 0 + 12(0) + C, \text{ therefore } C=0.$$

The approximate equation for amount sold in any hour is $s(t) = .5\sin t + 12t$.