How would we measure total distance traveled? We have to consider the intervals when $v(t) \geq 0$ and when $v(t) \leq 0$. Therefore,

$$\text{total distance traveled} = \int_a^b |v(t)|\ dt$$

.

Change the title of Example 128 to be Finding displacement and total distance traveled

Change the last sentence of the directions to Example 128 to read: Find and interpret, 1. $\displaystyle\int_0^1 v(t)\ dt$ and 2. $\displaystyle\int_0^1 |v(t)|\ dt$.

Solution to part 1. reads:

Using the Fundamental Theorem of Calculus, we have

$$\begin{aligned}\int_0^1 v(t)\ dt &= \int_0^1 (-32t+20)\ dt \\ &= -16t^2+20t\Big|_0^1 \\ &= 4 \text{ ft.}\end{aligned}$$

Thus if a ball is thrown straight up into the air with velocity $v(t) = -32t+20$, the height of the ball, 1 second later, will be 4 feet above the initial height. We will see in part 2. that the *distance traveled* is much farther. It has gone up to its peak and is falling down, but the difference between its height at $t = 0$ and $t = 1$ is 4 ft.

Solution to part 2. reads: Here we are trying to find the total distance traveled by the ball. We must first consider where $v(t) > 0$ and $v(t) < 0$.

$$\begin{aligned}v(t) = -32t+20 &= 0 \\ -32t &= -20 \\ t &= \frac{5}{8}\end{aligned}$$

$v(t) > 0$ for $t < \frac{5}{8}$ and $v(t) < 0$ for $t > \frac{5}{8}$ so we have

$$\begin{aligned}\int_0^1 |v(t)|\ dt &= \int_0^{5/8} v(t)\ dt + \int_{5/8}^1 -v(t)\ dt \\ &= \int_0^{5/8} -32t+20\ dt + \int_{5/8}^1 32t-20\ dt \\ &= \frac{34}{4} = 8.5 \text{ ft.}\end{aligned}$$

Add the following two exercises after 28.

$\displaystyle\int_0^2 |x^2-1|\ dx$ Solution: 2

$\int_0^3 |1-2x|\ dx$ Solution: $\frac{7}{2}$

Change directions for 40-44 to read: ..... Find a) the displacement of the object over the given time interval and b) the total distance traveled by the object over the given time interval.

49-52 should be moved to the Area between curves section.