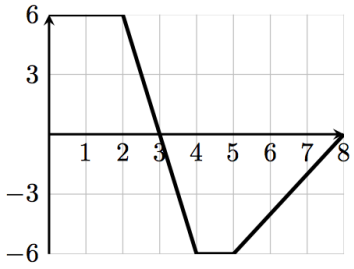
FUNDAMENTAL THEOREM OF CALCULUS

NAME: _____

May 1, 2017



(1) **Warm-up:** The graph of $f(x)$ is given above. Compute the following integrals:

(a) $\int_0^2 f(x)\,dx =$

(b) $\int_0^3 f(x)\,dx =$

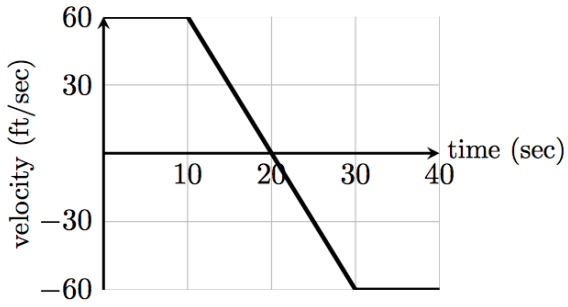
(c) $\int_4^5 f(x)\,dx =$

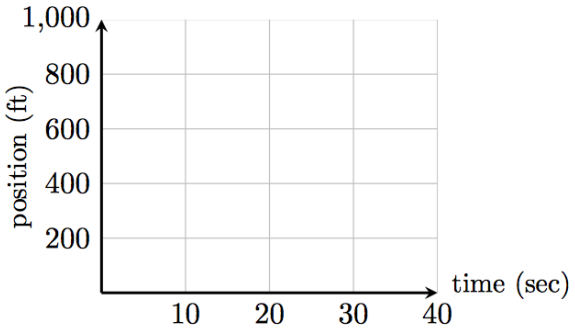
(d) $\int_5^8 f(x)\,dx =$

(e) $\int_2^4 f(x)\,dx =$

(f) $\int_0^8 f(x)\,dx =$

(2) Let $s(t)$ be the position, in feet, of a car along a straight highway at time t seconds. Positive values of s indicate eastward displacement of the car from home, and negative values indicate westward displacement. At $t = 0$ the car is at home. Let $v(t)$ represent the velocity of the same car, in feet per second, at time t seconds.





(a) Write definite integrals representing:

(i) $s(10) =$

(ii) $s(30) =$

(iii) $s(t) =$

(b) Use these integrals and the velocity graph to help fill in the chart below. Use this to plot the position function on the graph above.

t	0	10	20	30	40
$s(t)$	0				

(c) Fill in the chart below:

Definite integral of velocity	Change in position
$\int_0^{10} v(t)\,dt =$	$s(10) - s(0) =$
$\int_{10}^{20} v(t)\,dt =$	$s(20) - s(10) =$
$\int_0^{40} v(t)\,dt =$	$s(40) - s(0) =$

(d) What do you notice about these quantities? Can you come up with a formula to relate the integral of $v(t)$ and $s(t)$?

This formula from the previous question is part of a more general formula that will let us evaluate any integral; this is known as the **Fundamental Theorem of Calculus.**