Mathematics 122

Quiz #31 Name: Key

You must show your work to get full credit.

1. The Fundamental Theorem of Calculus tells us that if $F'(x) = f(x)$ that

$$\int_a^b f(x) = F(b) - F(a).$$

Let c be a constant and let $f(x) = 3cx^2$. (a) Find a function $F(x)$ such that $F'(x) = f(x)$.

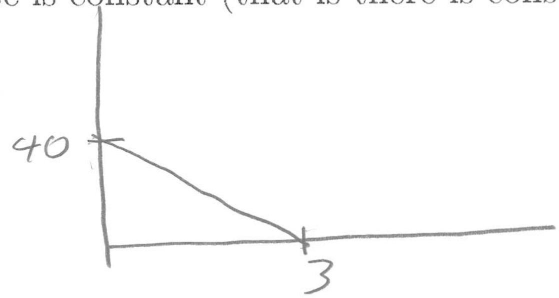
$F(x) =$ cx^3

(b) Compute $\int_0^c 3cx^2\,dx$. $\int_0^c 3cx^2\,dx =$ c^4

$$= cx^3\Big|_0^c = c(c)^3 - c(0)^3 = c^4$$

2. A car is going 40 ft/sec when it applies its brakes and comes to a stop 3 seconds later. Assume that the braking rate is constant (that is there is constant negative acceleration while braking).

(a) Draw a graph of the velocity.



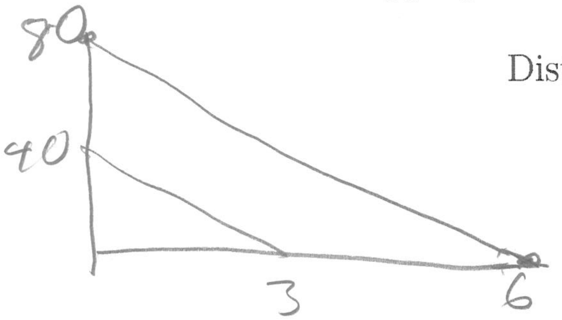
(b) How far does the car travel before it stops.

Distance traveled is 60 ft

Distane = area under rate graph = Area

$= \frac{1}{2}(40)(3) = 60$

(c) If the car was going 80 ft/set and braked at the same constant rate then how far doe it travel before stopping?



Distance traveled is 240 ft

Area $= \frac{1}{2}(80)(6)$

$= 240$

3. The rate, $r(t)$ in gallons/hour, that water is flowing into a tank is measure every quarter of an hour for an hour. The results are in the following table

t	0.0	0.25	0.50	0.75	1.00
$r(t)$	50	46	42	39	36

We wish to estimate the total flow during this hour. Find the following

$.25(50+46+42+39) \longrightarrow$

An upper bound for total flow: 42.25

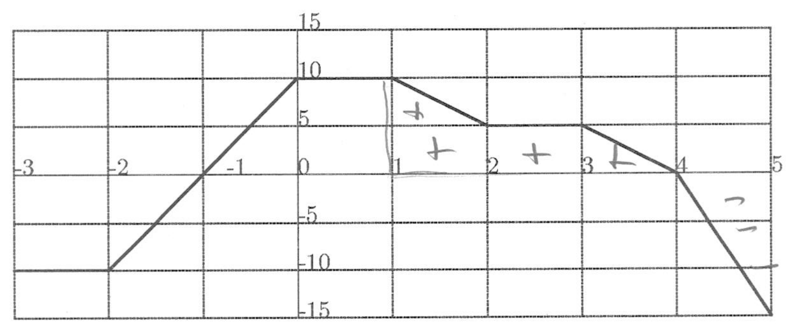
$.25(46+42+39+36)$

A lower bound for total flow: 40.75

The best guess for the total flow: 42.5

$\dfrac{42.25 + 40.74}{2}$

4. The graph of $y = f(x)$ is below.



1 box = 5

Find

$$\int_1^5 f(x)\,dx = \underline{(3-1.5) \text{ boxes}} = 7.5$$
$= (1.5)(5)$

5. A tank starts with 100 gallons of water. If water is pumped out at a rate of $r(t) = \dfrac{20+t}{1+10t}$ gallons/minute. Then how much water is left in the tank after 5 minutes?

Amount in tank is: 91.676

$200 - \int_0^5 \frac{50+t}{1+10t}\,dt$

$= 200 - \text{fnInt}((150+X)/(1+10X), X, 0, 5)$

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