

Name: Key

Show your work. Answers without work earn reduced credit.

1. [3 parts, 1 point each] Consider the definite integral  $\int_0^6 x^2 dx$ .

(a) Find the Left Hand Sum with  $n = 3$ .

$$\text{LHS} = 0 \cdot 2 + 4 \cdot 2 + 16 \cdot 2 = \boxed{40}$$

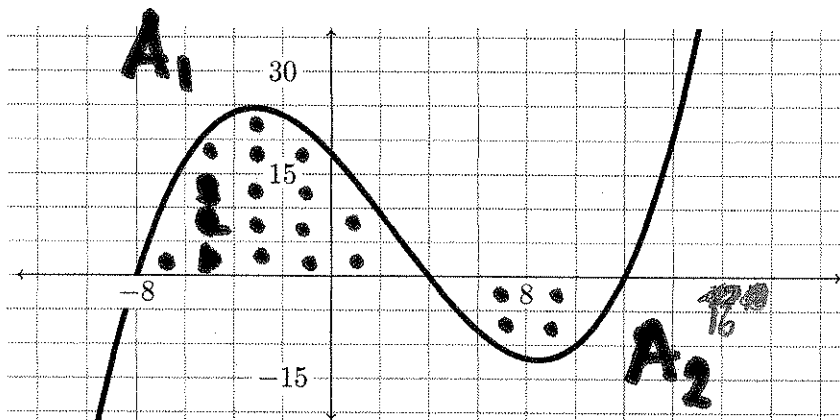
(b) Find the Right Hand Sum with  $n = 3$ .

$$\text{RHS} = 4 \cdot 2 + 16 \cdot 2 + 36 \cdot 2 = 56 \cdot 2 = \boxed{112}$$

(c) Average the LHS and the RHS to obtain an estimate of the value of the integral.

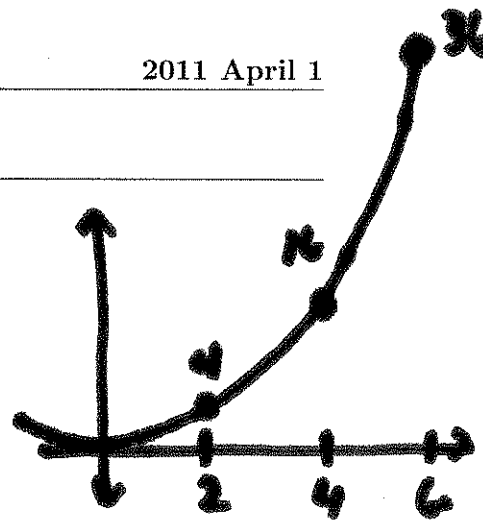
$$\text{Avg} = \frac{1}{2}(40 + 112) = 20 + 56 = \boxed{76}$$

2. [2 points] Use the graph of  $f(t)$  to estimate the value of the integral  $\int_{-8}^{12} f(t) dt$ .

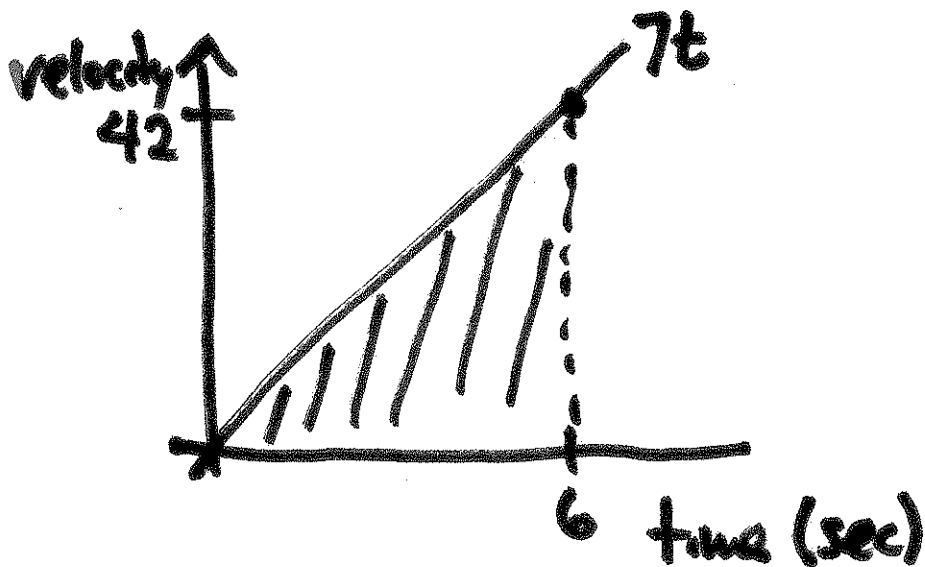


Each Box: 10 (5x2).  
 $A_1$  Boxes:  $16 + 6 \cdot \frac{1}{2} = 19$   
 $A_2$  Boxes: about 6.

$$\int_{-8}^{12} f(t) dt \approx 190 - 60 \approx \boxed{130}$$



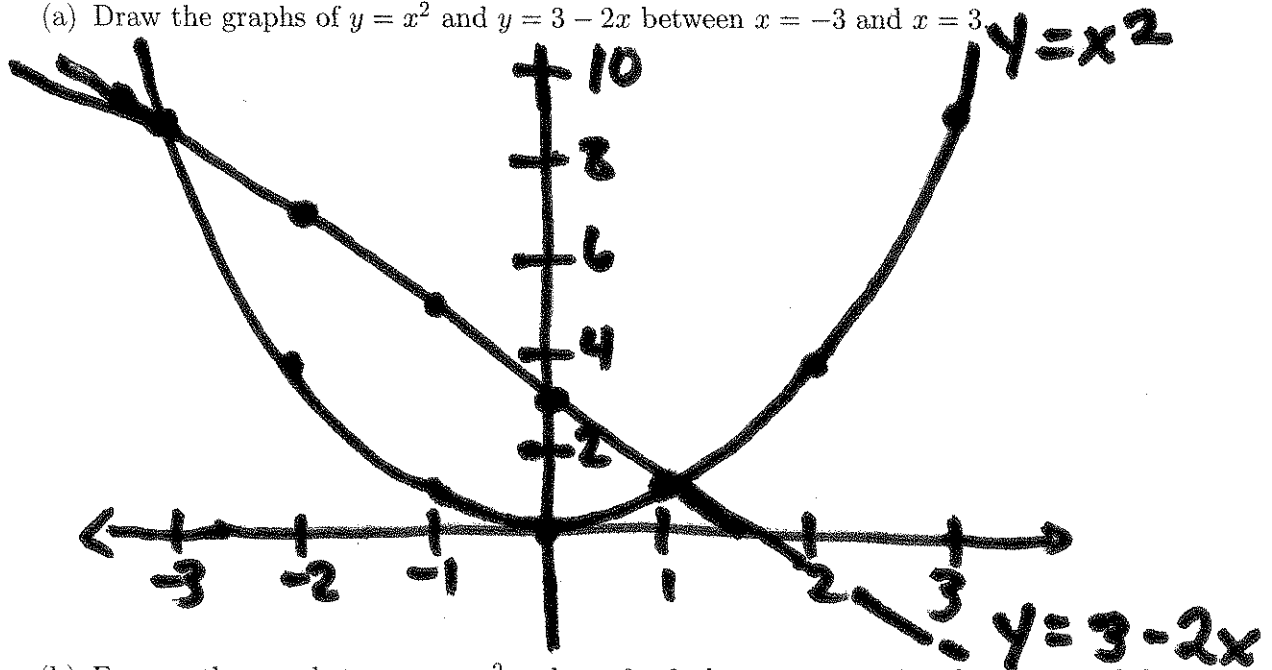
3. [3 points] The velocity of a car is  $f(t) = 7t$  meters per second. Use a graph of  $f(t)$  to find the exact distance traveled by the car, in meters, from  $t = 0$  to  $t = 6$  seconds.



$$\begin{aligned} \text{Dist} &= \text{Area} \\ &= \frac{1}{2}bh \\ &= \frac{1}{2} \cdot 6 \cdot 42 \\ &= \boxed{126 \text{ meters}} \end{aligned}$$

4. [2 parts, 1 point each]

(a) Draw the graphs of  $y = x^2$  and  $y = 3 - 2x$  between  $x = -3$  and  $x = 3$ .



(b) Express the area between  $y = x^2$  and  $y = 3 - 2x$  between  $x = -3$  and  $x = 1$  as a definite integral. (You should not find the value of this integral.)

$$\text{Area} = \int_{-3}^1 (3 - 2x) - x^2 \, dx$$