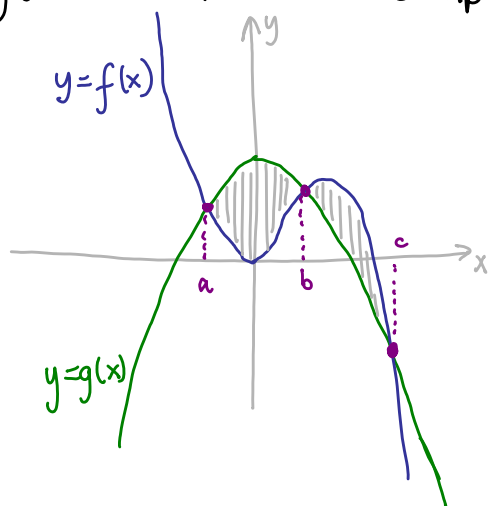


Math 124 Sec 16 Quiz 7 Solutions Oct 29, 2007

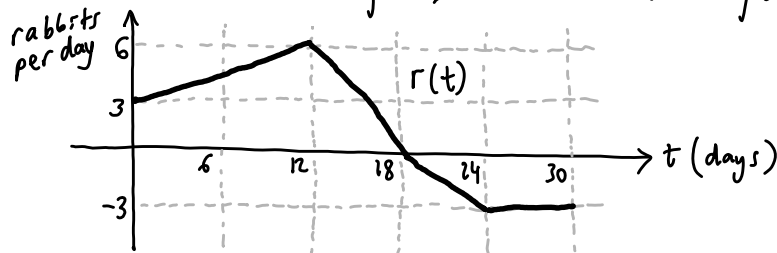
- ① Carefully sketch the region bounded by $f(x) = 3x^2 - x^3$ and $g(x) = 5 - x^2$ and compute its area



$$\left. \begin{aligned} Y_1 &= 3x^2 - x^3 \\ Y_2 &= 5 - x^2 \end{aligned} \right\} \begin{array}{l} 2^{\text{nd}} \text{ Trace} \rightarrow 5: \text{intersect} \\ a = -1 \\ b = 1.3819 \\ c = 3.618 \end{array}$$

$$\begin{aligned} \text{Area} &= \int_{-1}^{1.3819} (5 - x^2) - (3x^2 - x^3) dx + \int_{1.3819}^{3.618} (3x^2 - x^3) - (5 - x^2) dx \\ &= 7.7192 + 6.5218 = 14.241 \end{aligned}$$

- ② The rate of change in a rabbit population is given by the function $r(t)$ in the graph below, where t is days since January 1st. If initially there are 200 rabbits at the farm, answer the following.



- (a) During which time interval is the rabbit population increasing?
during days 0-18, since rate of change is positive
- (b) What was the most number of rabbits present during these 30 days?
after day 18 the population decreases, so population at day 18 is the largest.
 $\int_0^{18} r(t) dt = 4 \times 18 = 72 = \Delta \text{ population}$
initially 200 rabbits, hence largest population: $200 + 72 = 272$
- (c) How many rabbits are there at the end of January?
 $\Delta \text{ population} = \int_0^{30} r(t) dt = 4 \times 18 - 1.5 \times 18 = 45$
Final population = $200 + \Delta \text{ population} = 245$ rabbits