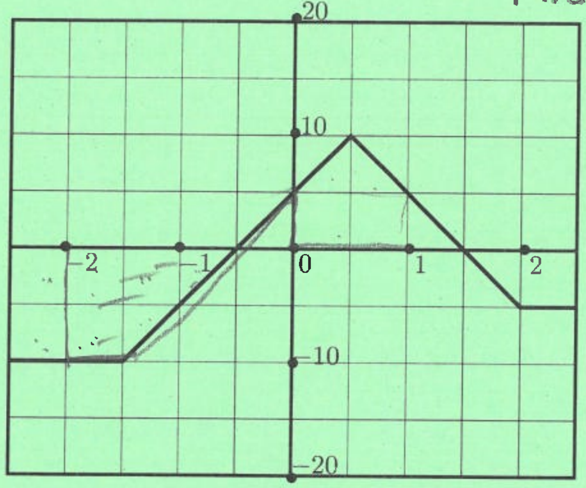
Mathematics 122

Quiz 27 Name: Key

You must show your work to get full credit.

1. The following graph shows rate of chance of an investment measured in thousands of dollars per week. Here $t = 0$ is the beginning of the fiscal year.

1 box = ($5000/week)(.5 weeks) = $2500



(a) By how much did the investment increase during the first week of the fiscal year?

The increase was $7,500

Change = signed area between graph and x-axis. There are $1+1+\frac{1}{2}+\frac{1}{2} = 3$ boxes $= 3(2500) = \$7500$

(b) What was the total change in the investment in the two weeks before the start of the fiscal year?

Total change was -$8,750

This is $\underbrace{-4 \text{ boxes}}_{\text{below axis}} + \underbrace{.5 \text{ box}}_{\text{above axis}}$

$= -3.5$ boxes $= -3.5(2500) = -8750.$

(c) If the function is $f(t)$, then write a sentence or two explaining what the integral

$$\int_{-2.5}^{1} f(t)\, dt$$

means in terms of the investment.

The change in the value of the investment between $t = -2.5$ and $t = 1$

(d) What is the value of this integral? $\int_{-2.5}^{1} f(t)\, dt =$ -$6250

$(-6+3.5)$ boxes $= -2.5$ boxes $= -2.5(2500) =$

2. A group on campus is selling tee shirts. They find that if the shirts are sold for \$25.00 that demand is 1,200 shirts and that for every 50¢ they decrease the price the demand goes up by 100.

(a) Find the demand, D, as a function of the price p.

p	25	24.5
D	1200	1300

and the relation is linear

$D(p) =$ $1200 - 200(p-25)$

$$\frac{D-1200}{p-25} = \frac{1300-1200}{24.5-25} = \frac{100}{-.5} = -200$$

$$D - 1200 = -200(p-25)$$

$$D = 1200 - 200(p-25)$$

(b) What is the revenue as a function of p?

$R(p) =$ $p(1200 - 200(p-25))$

$R(p) = (\text{price}) \times (\text{Demand})$

$= p(1200 - 200(p-25))$

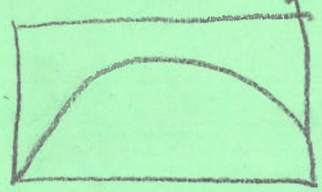
(c) What is the price that maximizes the revenue and what is the maximum revenue?

$p =$ \$15.50 $\qquad R =$ 48050

\Y1 = X(1200 − 200(X−25))

Xmin = 0

Xmax = 30



2nd calc 4: maximum

(d) If the cost of producing q shirts is

$$C(q) = 1000 + 10q$$

what price p maximizes the profit and what is the maximum profit?

$p =$ 20.5 $\qquad$ The maximum profit is \$21,050

At price p the demand is $q = D(p)$
so cost as function of price is

$$C(p) = 1000 + 10(1200 - 200(p-25))$$

so profit is

$$\pi(p) = R(p) - C(p)$$

$$= p(1200 - 200(p-25)) - 1000 - 10(1200 - 200(p-25))$$

$$= -1000 + (1200 - 200(p-25))(p-10)$$

\Y1 = −1000 + (1200 − 200(X−25))(X−10)

Xmin = 0

Xmax = 30