

- (a) Compute the MR at $q = 300$ Things.
- (b) Find the longest interval over which the AR is between 0.50 and 0.80 dollars per Thing.
- (c) Suppose $FC = \$300$. What quantity will maximize profit and what is the maximum profit?

(a) $MR(300) = TR(301) - TR(300) = \frac{TR(301) - TR(300)}{301 - 300}$
 $=$ SLOPE OF "SECANT" FROM 300 TO 301
 \approx SLOPE OF TANGENT AT 300.

2 POINTS: $(600, 1000)$ $(150, 200)$
 $SLOPE \approx \frac{1000 - 200}{600 - 150} = \frac{800}{450} \approx 1.78$

$MR(300) \approx 1.45$ dollars/Thing

(b) $AR(q) = \frac{TR(q)}{q} =$ "SLOPE OF DIAGONAL" LINE TO TR GRAPH"

GIVEN SLOPE 0.50 AND 0.80.

DRAW REF. LINES

$0.50 \rightarrow (1000, 500) \Rightarrow AR(1410) \approx 0.50$

$0.80 \rightarrow (1000, 800) \Rightarrow AR(1160) \approx 0.80$

SO $AR(q)$ IS BETWEEN 0.50 & 0.80

WHEN q IS BETWEEN 1410 AND 1160

(c) $TC(q) = 300 + VC(q)$

DRAW TC BY SHIFTING VC 300 UP
 (SLIDE RULER PARALLEL)

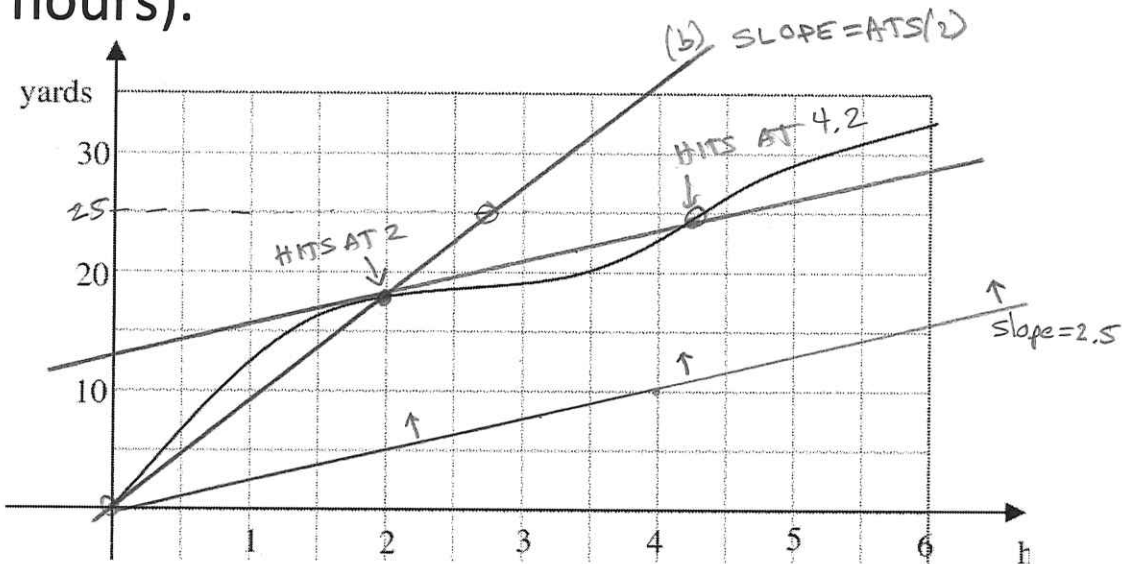
MAX PROFIT \Leftrightarrow MATCH SLOPE OF TR & TC

$q \approx 750$ THINGS

MAX PROFIT = $TR(750) - TC(750)$
 $\approx 960 - 610$
 $= 350$ DOLLARS

Old Exam Questions:

The graph below represents the distance (in yards), $D(t)$, traveled by the Mars Rover vehicle up to time (in hours).



(a) How long did it take the Rover to travel the first 25 yards?

(b) What was the ATS of the Rover at two hours?

(c) Find a time t such that

$$\frac{D(t) - D(2)}{t - 2} = 2.5$$

(a) WANT TO KNOW WHEN $D(t) = 25$.
ABOUT $t = 4.3$ HOURS

(b) $ATS(2) = \frac{D(2)}{2} =$ "SLOPE OF DIAGONAL LINE TO $D(t)$ AT 2"

DRAW LINE, FIND 2 PTS: $(0,0)$ $(2.75, 25)$

$$SLOPE = \frac{25 - 0}{2.75 - 0} = 9.09$$

ABOUT 9.1 yards/hour

(c) $\frac{D(t) - D(2)}{t - 2} =$ "SLOPE OF SECANT TO $D(t)$ FROM 2 TO t "
 $= 2.5 \leftarrow$ GIVEN SLOPE

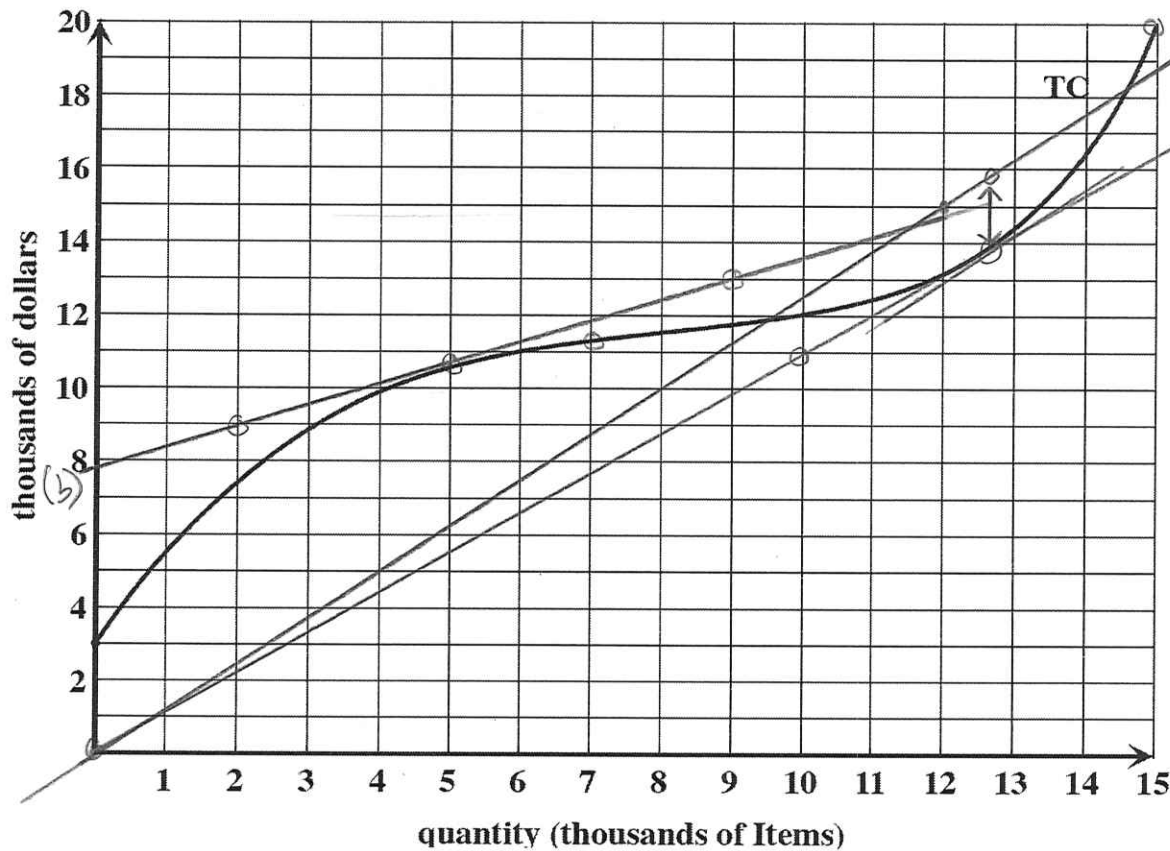
REFERENCE LINE $(0,0)$, $(2,5)$, $(4,10)$

SLIDE PARALLEL UNTIL HITS GRAPH AT 2.

FROM 2 TO ABOUT 4.2? THE SLOPE IS 2.5!

$$\frac{D(4.2) - D(2)}{4.2 - 2} \approx 2.5$$

$t \approx 4.2$ HOURS



- Compute BEP.
- Compute MC at $q = 5$
- Compute change in TC from 7 to 15
- Compute $AVC(6)$
- If market price is \$1.25, what is the value of maximum profit?

(a) DRAW LOWEST DIAGONAL TOUCHING TC

2 PTS (0,0) (10,11)
 slope = $\frac{11-0}{10-0} = 1.1$

BEP = 1.10 DOLLARS / ITEM

(b) $MC(s) \approx$ SLOPE OF TANGENT AT S
 $= \frac{TC(s.001) - TC(s)}{0.001}$

2 PTS: (2,9) (9,13)

slope $\approx \frac{13-9}{9-2} = \frac{4}{7} = 0.57$ DOLLARS / ITEM

$MC(s) = 0.57$ DOLLARS / ITEM

(c) WANT $TC(15) - TC(7)$

$\approx 20 - 11.2 = 8.8$

SO TC GOES UP ABOUT **8.8 THOUSAND \$**

(d) $AVC(6) = \frac{VC(6)}{6}$

SINCE $TC(6) \approx 11$ AND $FC \approx 3$

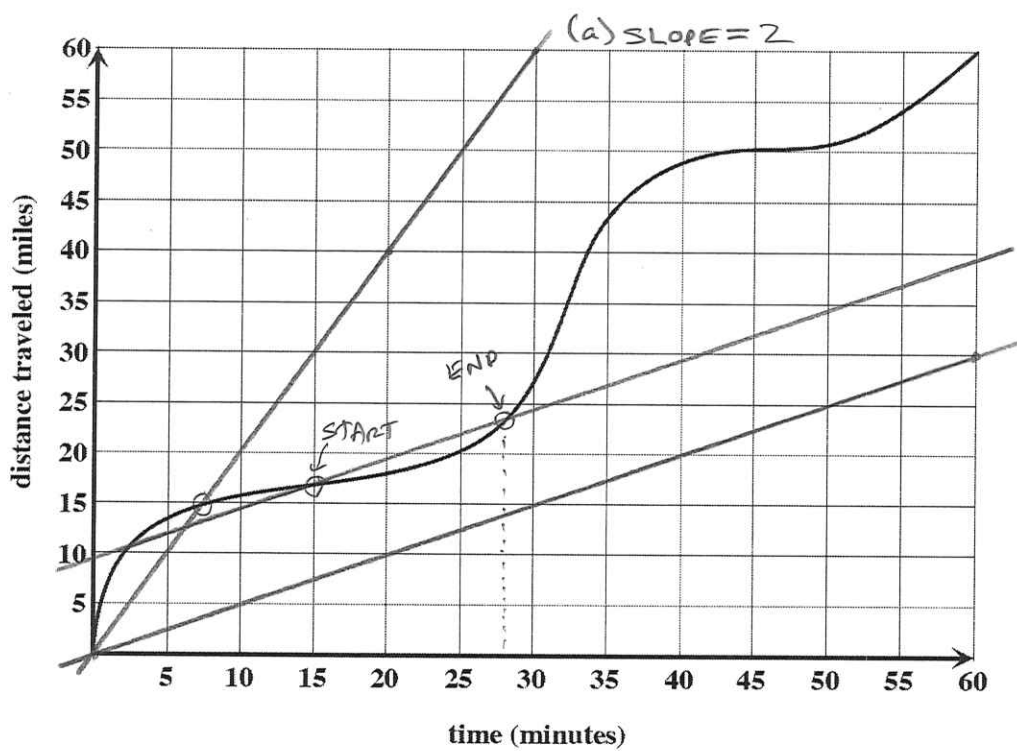
WE MUST HAVE $VC(6) = 11 - 3 = 8$

SO $AVC(6) = \frac{8}{6} = 1.33$ DOLLARS / ITEM

(e) DRAW TR, slope = 1.25 \rightarrow (10,12.50) (12,15)
 MATCH SLOPES! AT ABOUT 12.7

MAX PROFIT = $TR(12.7) - TC(12.7)$

$\approx 14.9 - 13.9 \approx 1$ THOUSAND \$



- (a) Find the time at which ATS is 2 mile per minute.
- (b) The car's average speed from $t = 15$ to $t = b$ is 0.5 miles per minute. What is b ?

(a) DRAW REFERENCE LINE WITH
SLOPE = 2
FIND WHEN DIAG. LINE HITS DISTANCE
ATS!

$$t \approx 7 \text{ MINUTES}$$

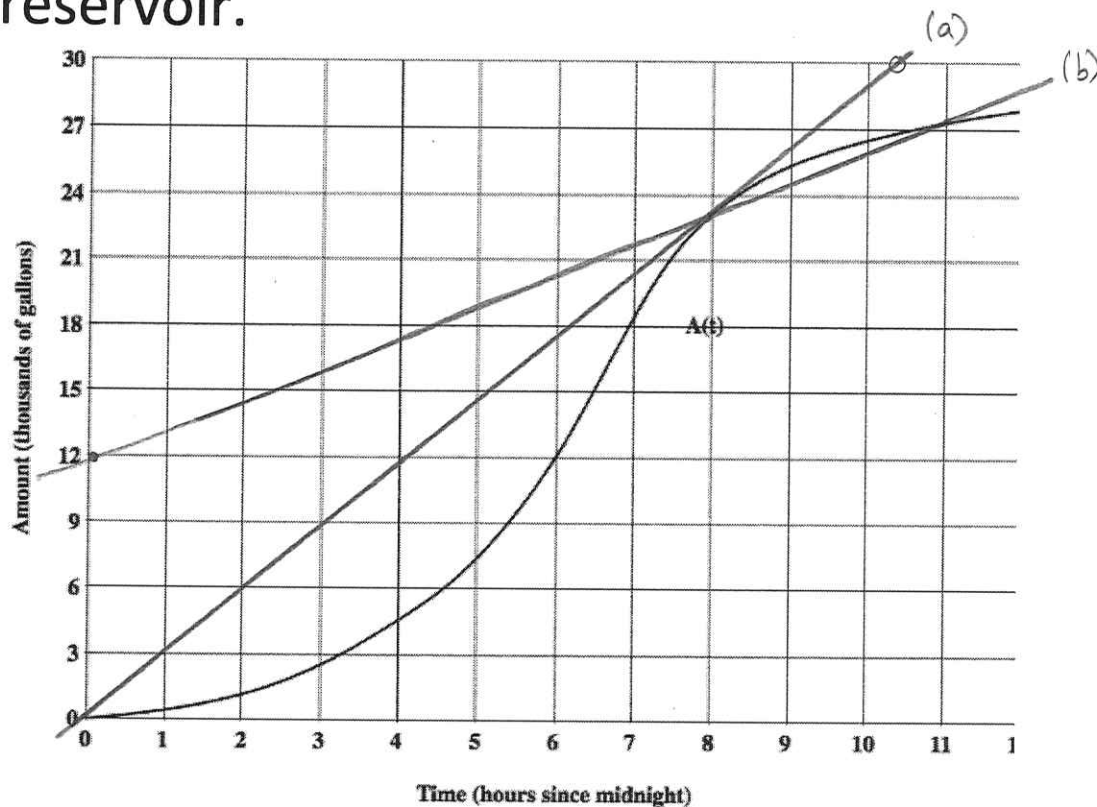
(b) $\frac{D(\text{END}) - D(\text{START})}{b - 15} = 0.5$ GIVEN SLOPE
FIND THIS

DRAW REFERENCE LINE. $\rightarrow (40, 20) (60, 30)$

SLIDE PARALLEL UNTIL IT HITS
GRAPH AT $t = 15$

$$\text{ENDS AT } b = 28$$

The graph below gives the total amount of water $A(t)$ that flows into a reservoir.



(a) WANT LARGEST DIAGONAL SLOPE

2 PTS: (0,0) (10.3, 30)

$$\text{slope} \approx \frac{30}{10.3} = \boxed{2.91 \frac{\text{THOUSAND GALLONS}}{\text{Hour}}}$$

(b) WANT SLOPE FROM 8 TO 11

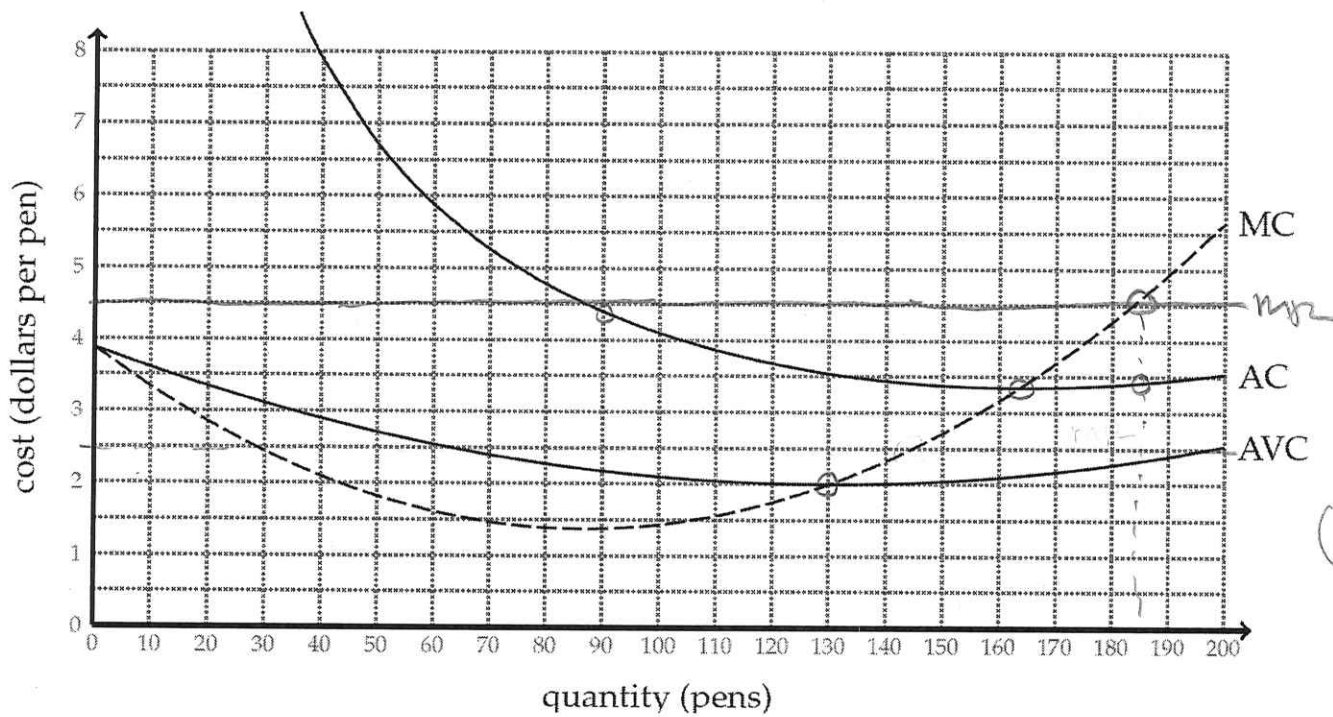
2 PTS: (0,12) (11, 27.5)

$$\text{slope} \approx \frac{27.5 - 12}{11 - 0} = \frac{15.5}{11} \approx 1.41$$

$$\boxed{1.41 \frac{\text{THOUSAND GALLONS}}{\text{Hour}}}$$

(a) Compute the largest value of $\frac{A(t)}{t}$

(b) Find the average rate of flow of water into the reservoir from 8am to 11am.



$$(a) AC(90) = \frac{TC(90)}{90}$$

$$\approx 4.4 = \frac{TC(90)}{90}$$

$$\Rightarrow TC(90) \approx 4.4 \cdot 90$$

$$\approx \boxed{396 \text{ DOLLARS}}$$

(b) PRICE = 2.50

BEP ≈ 3.40 \$/pen

SDP ≈ 2.00 \$/pen

$\$2.50$ IS ABOVE SDP
STAY OPEN

- (a) Compute the total cost of producing 90 pens.
- (b) Suppose market price is \$2.50 per pen. Should you shut down production?
- (c) Suppose market price is \$4.50 per pen. What is the maximum possible profit?

(c) PRICE = 4.50 \$/pen \Rightarrow MR = 4.50

PROFIT WILL BE MAXIMUM } Q = 185
WHEN MR = MC

MAX PROFIT = TR(185) - TC(185)

$$\approx 4.50 \cdot 185 - 3.40 \cdot 185 \approx \boxed{\$203.50}$$

PRICE ↑ ↑ QUANTITY ↑ AC(185)