$slope = \dfrac{30}{10} = \dfrac{3}{1}$

Cheri also works for the credit card company. She calls existing customers to sell them additional services for their account. The next table shows how much Cheri earns for selling selected numbers of additional services

| Number of Services sold | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|
| Daily Pay (In dollars) | 50 | 80 | 110 | 140 | 170 |

**a.** Does Cheri's daily pay appear to be a <u>linear function</u> of the number of services sold? <u>Explain.</u>

yes, because daily pay inc $30 per every 10 services sold

$y = 3x + 20$

**b.** Assume that Cheri's daily pay is a linear function of the number of services she sells, and calculate the missing entries in the next table.

$\dfrac{30}{10} = \dfrac{15}{5}$

| Number of services sold | 0 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 100 | 101 |
|---|---|---|---|---|---|---|---|---|---|---|
| Daily Pay (In dollars) | 20 | 50 | 65 | 80 | 95 | 110 | 140 | 170 | 320 | 323 |

A key feature of any function is the way the value of the dependent variable changes as the value of the independent variable changes. Notice that as the number of services Cheri sells increases from 30 to 40, her pay increases from $110 to $140. This is an increase of $30 in pay for an increase of 10 in the number of services sold, or an average of $3 per sale. Her pay increases at a *rate* of $3 per service sold.

**c. i)** Using your table from Part b, study the *rate of change* in Cheri's daily pay as the number of services she sells increases by completing entries in a table like the one below.

| Change in Sales $\Delta x$ | Change in Pay $\Delta y$ | Rate of change $= \dfrac{\Delta y}{\Delta x} = \dfrac{\text{Change in Pay}}{\text{Change in Sales}}$ |
|---|---|---|
| 10 to 20 (10) | 50 to 80 (30) | $\dfrac{30}{10} = 3$ |
| 20 to 25 (5) | 80 to 95 (15) | $\dfrac{15}{5} = 3$ |
| 25 to 40 (15) | 95 to 140 (45) | $\dfrac{45}{15} = 3$ |
| 50 to 100 (50) | 170 to 320 (150) | $\dfrac{150}{50} = 3$ |

**d.** Write a recursive rule for the situation

$a_n = a_{n-1} + 3 \quad a_0 = 20$
slope ↑    ↑ y-int

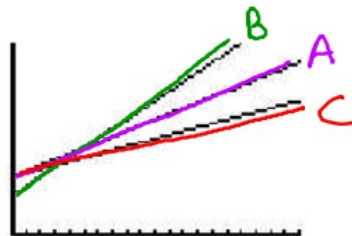**e.** Write a function rule for the situation

$y = 3x + 20$

**ii.** What do the numbers in the rule(s) you wrote tell you about Cheri's daily pay?

$20 for showing up     $3 per service sold

3. The diagram below shows graphs of pay plans offered by three different banks to employees who collect credit card applications.

Atlantic Bank: $A = 30 + 3n$     Boston Bank: $B = 20 + 5n$     Consumers Bank: $C = 30 + 2n$



a. Match each function rule with its graph. Explain how you can make the matches without calculations or graphing tool help.

b. What do the numbers in the rule for the pay plan at Atlantic Bank tell you about the relationship between daily pay and number of credit card applications collected?
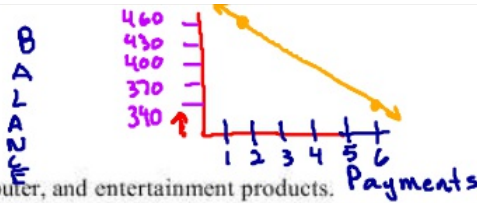
$A = 30 + 3n$     $30 to start
$3 for ever app

c. What do the numbers in the rule for the pay plan at Consumers Bank tell you about the relationship between daily pay and number of credit card applications collected?

$C = 30 + 2n$     $30 to start
$2 per app

d. What do the numbers in the rule for the pay plan at Boston Bank tell you about the relationship between daily pay and number of credit card applications collected?

$B = 20 + 5n$     $20 to start
$5 per app

*(handwritten graph, top right)*

B A L A N C E (vertical label)

460
430
400
370
340

1 2 3 4 5 6 — Payments

**4. Buying on Credit** Electric Avenue sells audio/video, computer, and entertainment products. The store offers 0% interest for 12 months on purchases made using an Electric Avenue store credit card. Emily purchased a television for $520 using an Electric Avenue store credit card. Suppose she pays the minimum monthly payment of $30 each month for the first 12 months.

**a.** Complete a table of (*number of monthly payments, account balance*) values for the first 6 months after the purchase.

*(X)* *(y)*

| Number of Monthly Payments | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 12 |
|---|---|---|---|---|---|---|---|---|
| Account Balance (in dollars) | 520 | 490 | 460 | 430 | 400 | 370 | 340 | 160 |

**b.** Graph the data on a piece of graph paper.　　**c.** Will Emily pay off the balance within 12 months? **NO**

6 months she paid  520 - 340 = $180

**d.** Write a recursive rule for the situation above.　　**e.** Write a function rule for the situation above.

$a_n = a_{n-1} - 30$　$a_0 = 520$　　　$y = 520 - 30x$

**f.** Determine the rate of change, including units, in the account balance as the number of monthly payments increases from:

| Change in Sales | Change in Account Balance | Rate of change = $\dfrac{\Delta y}{\Delta x} = \dfrac{\text{Change in Pay}}{\text{Change in Sales}}$ |
|---|---|---|
| 0 to 2 　$2 | 520 to 460　 -$60 | $\dfrac{-60}{2} = -30$ |
| 2 to 3 　1 | -30 | $\dfrac{-30}{1} = -30$ |
| 3 to 6 　3 | -90 | $\dfrac{-90}{3} = -30$ |

**g.**　How does the rate of change reflect the fact that the account balance *decreases* as the number of monthly payments increases?

Slope is negative

**i.** How can the rate of change be seen in the graph?　　slope　　**ii)** How can the rate of change be seen in the function rule.　　coefficient

**iii)**　How can the rate of change be seen in the table.

Constant -30 for each month

**h.**　What was the starting account balance for the situation? → 520

**i.** How can the starting balance be seen in the graph?　　y-int　　**ii)** How can the starting balance be seen in the table.　　x = 0

**iii)** How can the starting account balance be seen in the function rule.

Constant