Math 1 Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2-4 Writing Linear Functions** Date\_\_\_\_\_\_\_\_

* *I can correctly choose which formula best models a given situation.*
* *I can define and calculate the average rate of change of a function and explain the connection between average rate of change and slope.*
* *I can identify and graph a linear function in a variety of forms including, but not limited to: slope-intercept.*
* *I can write explicit/recursive equations to describe a real-world problem.*

Previously, you studied a variety of relationships between variables. Among the most common were linear functions – those with straight-line graphs, data patterns showing a constant rate of change and rules like 

For example, Barry works for a credit card company on college campuses. He entices students with free gifts (hats, water bottles, and t-shirts) to complete a credit card application. The graph below shows the relationship between Barry’s daily pay and the number of credit card applications he collects.

**

1. How does Barry’s daily pay change as the number of applications he collects increases? How is this shown in the graph?
2. If the linear patterns shown by the graph holds for other *(number of applications, daily pay)*  pairs, how much would you expect Barry to earn for a day during which he collects:
3. 1 application:
4. 13 applications:
5. 25 applications:
6. What information from the graph might you use to write a rule showing how to calculate daily pay for any number of applications?
7. For collecting credit card applications, Barry’s daily pay (*B*)is related to the number of applications he collects (*n*) by the function *B(n) = 20 + 5n*.
	1. Use the function rule to complete this table of sample *(n, B)* values:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **# of Applications** | 0 | 1 | 2 | 3 | 4 | 5 | 10 | 20 | 50 |
| **Daily Pay ($)** |   |   |   |   |   |   |   |   |   |

* 1. Compare the pattern of change shown in your table with that shown in the graph on the preceding page.

c. Barry will earn $\_\_\_\_\_\_\_\_\_ if he does not collect any credit card applications. This information

is seen in the rule $B\left(n\right)=20+5n$ because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

It can be seen in the table of sample *(n, B(n))* because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

It can be seen on the graph because\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

d. Barry earns $\_\_\_\_\_\_\_\_ extra for each application he collects. This information

is seen in the rule $B\left(n\right)=20+5n$ because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

It can be seen in the table of sample *(n, B(n))* because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

It can be seen on the graph because\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

e. Write a **recursive** **equation** showing how Barry’s daily pay changes with each new credit card application he collects. Put your answer on the line.

 **Example: **

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

f. *We will discuss this problem as a class…*What is the practical domain of the function?

 *We will discuss this problem as a class…*What is the practical range of the function?

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.



a. Does Cheri’s daily pay appear to be a linear function of the number of services sold? Explain.

b. Calculate the missing entries to Cheri’s table below.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **# of Applications** | 0 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 100 | 101 |
| **Daily Pay ($)** |   | 60 |   | 80 |   | 100 | 120 | 140 |   |   |

1. *Calculate Cheri’s average rate of change in pay from the following:*
2. 10 applications to 20 applications:
3. 20 applications to 25 applications:
4. 25 applications to 40 applications:
5. 50 applications to 100 applications:

d. Write a recursive equation showing how Cheri’s pay changes with each additional service sold.

ei. The function that shows how to calculate Cheri’s daily pay *C* for any number of services *n* she

sells is *C*(*n*) =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. I know this because. . .

eii. What do the numbers in the function you wrote down above (part ei) tell you about Cheri’s daily pay?

f. What is the practical domain of the function?

 What is the practical range of the function?

1. **The diagram to the right shows graphs of pay plans offered by three different banks to employees who collect card applications.**

a. Atlantic Bank matches with graph \_\_\_\_\_\_\_. I know this because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 Boston Bank matches with graph \_\_\_\_\_\_\_. I know this because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 Consumers Bank matches with graph \_\_\_\_\_\_\_. I know this because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

b. The numbers in the rule for the pay plan at Atlantic Bank tell me . . .

1. Emily purchased a television for $480 using an Electric Avenue store credit card. Suppose she pays the minimum monthly payment of $20 each month for the first 12 months. *(This store offers 0% interest for 12 months).*

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **# of Monthly Payments** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **Account Balance ($)** |   |   |   |   |   |   |   |

b. Emily \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *(will or will not)* pay off her balance in 12 months. I know this because. . .

c. Write a recursive equation to help you calculate the change in Emily’s account balance after each monthly payment.

1. Multiple Choice: Which of the following function rules gives Emily’s account balance *E* after *m* monthly payments have been made?

1. *E(m) = 20m – 480* B.) *E(m)=m – 20* C.) *E(m)=-20m + 480*

D.) *E(m) = 480 – 20m* E.) *E(m) = 480 + 20m*

e. The rate of change **(including units)** in the account balance from 0 to 2 months is \_\_\_\_\_\_\_\_\_\_\_.

 *Show work below!*

 The rate of change **(including units)** in the account balance from 2 to 3 months is \_\_\_\_\_\_\_\_\_\_\_.

 *Show work below!*

 The rate of change **(including units)** in the account balance from 3 to 6 months is \_\_\_\_\_\_\_\_\_\_\_.

 *Show work below!*

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

eii. How can the rate of change be seen in the:

 Table (from part a):

 Functions rule (part d):

f. How can the starting account balance be seen in the:

Table (part a):

Function rule (part d):



1. **The diagram to the right shows graphs of account balance functions for three Electric Avenue customers.**

a. Emily matches with graph \_\_\_\_\_\_\_. I know this because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 Darryl matches with graph \_\_\_\_\_\_\_. I know this because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 Felicia matches with graph \_\_\_\_\_\_\_. I know this because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

b. From Darryl’s equation I know that his starting balance is \_\_\_\_\_\_\_\_\_ and his monthly

payment is \_\_\_\_\_\_\_\_.

From Felicia’s rule I know. . .

6. *Graph the following functions.*

![[image]]()![[image]]() a.  b. 

For the equation in part (a) explain how the numbers in the symbolic rule relate to the graph.