NAME:_____ Math _____, Period _____

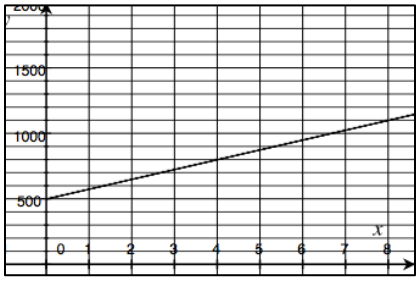
Mr. Rogove Date:_____

Linear Functions And Geometry
Study Guide

FUNCTIONS

Functions are rules that assign each input exactly one output.

We have described functions in four different ways:

<table>
<tr>
<td>Verbally/Written Description
I have $500 in my bank account now, and deposit $75 per week.</td>
<td>Equation
$y = 75x + 500$ or
$f(x) = 75x + 500$</td>
</tr>
<tr>
<td>Table
<table>
<tr><th>Weeks (x)</th><th>Money (y)</th></tr>
<tr><td>0</td><td>500</td></tr>
<tr><td>1</td><td>575</td></tr>
<tr><td>2</td><td>650</td></tr>
<tr><td>3</td><td>725</td></tr>
<tr><td>5</td><td>875</td></tr>
</table>
</td>
<td>Graph
 

</td>
</tr>
</table>

A **linear function** is a special kind of function where the function rule is specifically a linear equation in the form $y = mx + b$.
Characteristics of Linear Functions:

- The rate of change of a linear function stays constant.
- When the slope of a linear function is negative, the function is decreasing.

  When the slope of linear function is positive, the function is increasing.
- Linear functions graph as straight lines.
- Linear functions describe proportional relationships.

REMINDER: Some functions don't involve numbers at all.
Example: Input is car model (i.e. Accord), and output is car manufacturer (i.e Honda).

When we **talk** about functions, we say that the output is a function of the input.
Example: The money in my bank account is a function of the number of weeks I've saved.

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WHAT DOES A FUNCTION LOOK LIKE?

**In a table of values, there are NO *x*-values (input values) repeated

**On a graph, it means that a vertical line will only pass through the function ONCE.

Discrete v. Continuous Functions

A **discrete function** is a function that only has a specific set of inputs (such as integers).

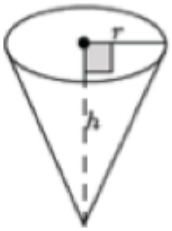
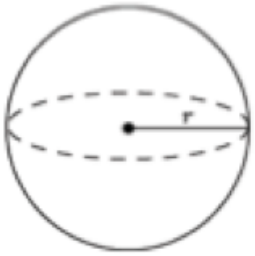
Example: A box of cookies costs $3.00. You can't buy a fractional box of cookies.

A **continuous function** is a function that could include rational number input values.

Example: A pound of grapes is $3.00. You can buy 3.5 pounds of grapes.

GEOMETRY (Volume of 3D shapes)

Remember these formulas

Cylinder	Cone	Sphere
$V = (\pi r^2)h$	$V = \frac{1}{3}(\pi r^2)h$	$V = \frac{4}{3}\pi r^3$
$V = (area\ of\ base) \times height$	$V = \frac{1}{3}(area\ of\ base) \times height$	
Height 	*The base is still a circle!*  *The vertex is the pointed part of the cone*	

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PROBLEM SET

Please complete all problems and submit as you take this assessment

1. Rachel is hiring a plumber to re-pipe her kitchen and bathroom. One plumbing company, LeakProof Plumbing Company, is charging a $500 for materials plus $120 per hour. Another company, DripFreeSince2003 Inc., does not charge for material, but their hourly rate is $165. A third company, CleanYerPipes.com, submits a bid to do the work for $2300 no matter how long it takes. No company provides an estimate of how many hours it will take.

a. Write linear equations that model the charges for each of the three companies.

b. If it takes 8 hours for the work to be completed, which company will provide the best value?

c. For what time interval is LeakProof Plumbing Company the cheapest alternative?

d. At what point does it become most economical to hire CleanYerPipes.com?

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2. LIGHT BULBS. Incandescent light bulbs have been used for many decades to provide light in homes and businesses. They cost about $1.50 each, and they last about 1,000 hours. Newer CFL light bulbs have been introduced that are more expensive—costing $10.00 each, but they last about 8,000 hours.

a. After how many hours will it pay to get the CFL bulbs? (think about using linear functions to help you answer).

b. To make things more interesting, what if I told you that the incandescent bulbs are much more inefficient, and they add $.01125 per hour to your electric bill. CFL bulbs will only add $0.00345 to your electric bill for each hour they are in use. How will this affect your determination of when it's more economical to buy incandescent bulbs v. CFL bulbs? Explain your answer using words and equations.

c. Even more expensive than CFL bulbs are newer LED light bulbs. LED light bulbs cost about $20 each but they last for an amazing 25,000 hours, and they cost almost nothing to use per hour (the cost is $0.00135) After how many hours of use will the LED bulbs be the most economical? Justify your answer.

d. If the typical household has their lights on 4 hours a day, how many YEARS would you expect each type of bulb to last?

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3. POWERBALL. The recent powerball lottery was worth $1.6Billion. Winners can decide to take a lump sum payout or they can get 30 annual payments. If they decide to take a lump sum, winners could expect approximately $992,000,000. Of course, the winners wouldn't get ALL that money. There are taxes to pay-the federal government will shave 39.6% from the total.

a. How much is the lump sum payment AFTER taxes are taken out?

b. How much is each annual installment AFTER taxes are taken out?

c. If you take the lump sum payment, how much money (in dollars) do you have to earn each year for the lump sum to turn out to be a better investment than the annual installments? Explain how you figured this out.

d. What would you do? Explain why.

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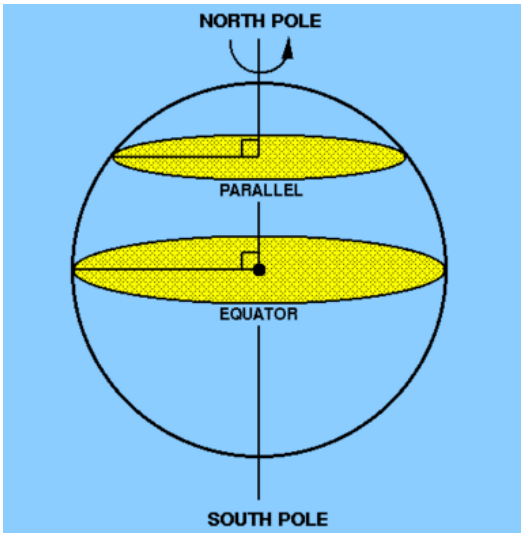
4. Assume the earth is perfectly round and that the equator is a good measure of the absolute largest circumference. If the equator is 24,900, what is the volume of the earth? (express your answer in terms of pi).



5a. Many ice cream cones are 1.5 inches in diameter at the top, and would stand about 4 inches tall. How much ice cream would be able to fit inside the cone (assume that ice cream does not pile on top of the cone, but is leveled at the top of the cone).

5b. Using the information from above, let's say instead of cones, they made "ice cream cylinders" for you to carry your delicious iced dairy treat. What are possible dimensions for a cylinder that will **twice** as much ice cream as the cone above?