

Classwork

## Exercises 1–5

1. Let  $f(x) = \sin x$ . Does f(2x) = 2f(x) for all values of x? Is it true for any values of x? Show work to justify your answer.

2. Let  $f(x) = \log(x)$ . Find a value for *a* such that f(2a) = 2f(a). Is there one? Show work to justify your answer.

3. Let  $f(x) = 10^x$ . Show that f(a + b) = f(a) + f(b) is true for  $a = b = \log(2)$  and that it is not true for a = b = 2.





S.5





4. Let  $f(x) = \frac{1}{x}$ . Are there any real numbers a and b so that f(a + b) = f(a) + f(b)? Explain.

5. What do your findings from these Exercises illustrate about the linearity of these functions? Explain.



Wishful Thinking—Does Linearity Hold? 12/29/14



**S.6** 





PRECALCULUS AND ADVANCED TOPICS

## **Problem Set**

Examine the equations given in Problems 1–4, and show that the functions  $f(x) = \cos x$  and  $f(x) = \tan x$  are not linear transformations by demonstrating that they do not satisfy the conditions indicated for all real numbers. Then, find values of x and/or y for which the statement holds true.

- 1.  $\cos(x + y) = \cos(x) + \cos(y)$
- $2. \quad \cos(2x) = 2\cos(x)$
- 3.  $\tan(x+y) = \tan(x) + \tan(y)$
- 4.  $\tan(2x) = 2\tan(x)$
- 5. Let  $f(x) = \frac{1}{x^2}$ , are there any real numbers a and b so that f(a + b) = f(a) + f(b)? Explain.
- 6. Let  $f(x) = \log x$ , find values of a such that f(3a) = 3f(a).
- 7. Let  $f(x) = \log x$ , find values of a such that f(ka) = kf(a).
- 8. Based on your results from the previous two problems, form a conjecture about whether  $f(x) = \log x$  represents a linear transformation.
- 9. Let  $f(x) = ax^2 + bx + c$ .
  - a. Describe the set of all values for a, b, and c that make f(x + y) = f(x) + f(y) valid for all real numbers x and y.
  - b. What does your result indicate about the linearity of quadratic functions?







© 2014 Common Core, Inc. Some rights reserved. commoncore.org

PRECALCULUS AND ADVANCED TOPICS

Lesson 2

M1

## **Trigonometry Table**

Angles Measure (x degrees)	Angle Measure (x radians)	$\sin(x)$	$\cos(x)$
0			
30			
	$\frac{\pi}{4}$		
	$\frac{\pi}{3}$		
90			

Wishful Thinking—Does Linearity Hold? 12/29/14

engage<sup>ny</sup>



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.