

MAT129 Test 2 (Spring 2010): 3.4-3.7, 3.9

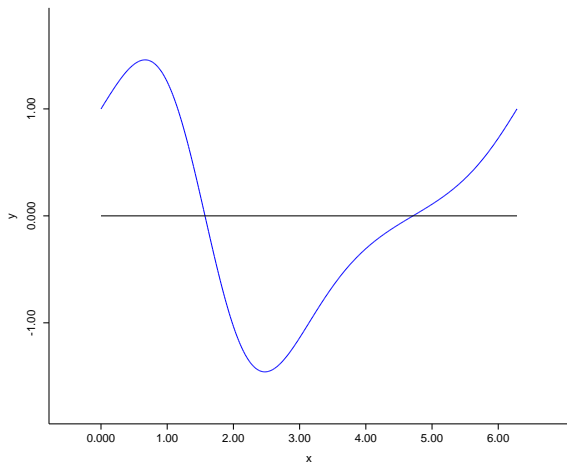
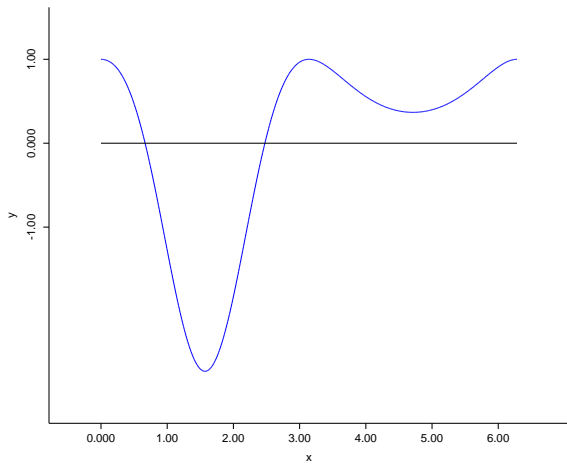
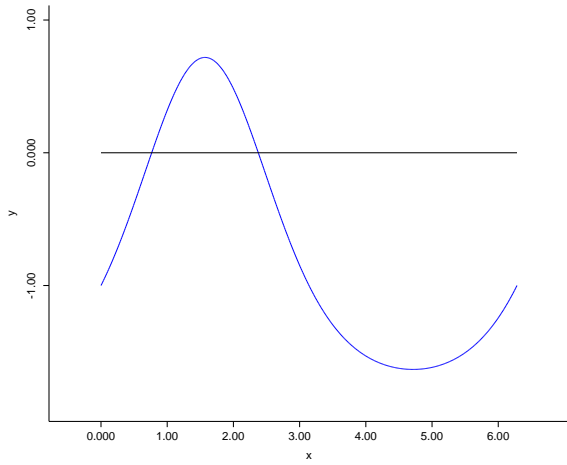
Name:

Directions: All problems are equally weighted. Show your work! Answers without justification will likely result in few points. Your written work also allows me the option of giving you partial credit in the event of an incorrect final answer (but good reasoning). Indicate clearly your answer to each problem (e.g., put a box around it).

Good luck!

Problem 1. A rock dropped from a bridge hits the water after 2 seconds. How high is the bridge? Assume that the acceleration due to the force of gravity is $32ft/s^2$.

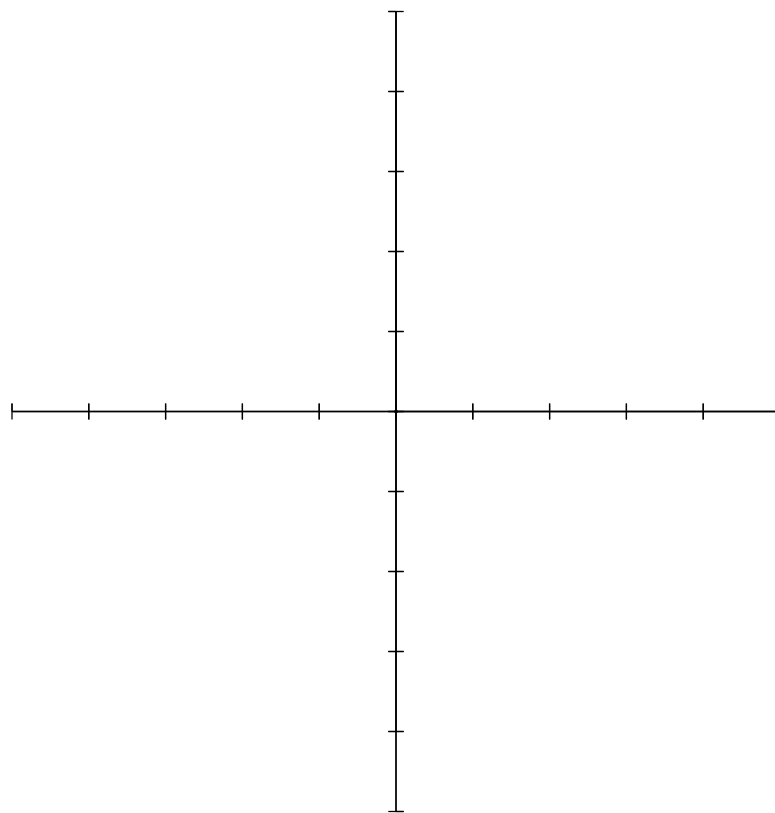
Problem 2. With reasons, determine which is the function, which its derivative, and which its second derivative:



Problem 3.

a. Describe how symmetry (even versus odd) plays out in the derivatives (and higher derivatives) of the trigonometric functions sine and cosine.

b. Compute and plot $\tan(x)$ and its derivative. What is the period of both?



Problem 4.

a. Use the chain rule to find the derivative $\frac{dy}{d\theta}$ when

$$y = \sin^2(\theta^3)$$

(Show your work!)

b. Which of the following (give reasons!) can be differentiated easily by hand *without* using the Chain Rule?

- $y = \cos(3x^2 - 7)$

- $y = \frac{x^2}{x - 1}$

- $y = \sqrt{x} \cdot \sin(x)$

- $y = \sqrt{x \cos(x)}$

Problem 5. An oil spill is spreading in a circular pattern on a still lake. At time $t = 0$ the spill begins. The spill layer is a centimeter thick. The oil is spilling out at a constant rate of 4 liters per minute (a liter is 10^3cm^3).

a. How fast is the radius changing at time $t = 4$?

b. How fast is the area changing at time $t = 10$?