

Calculus Review Unit 2 page 1 \_\_\_\_\_

Find the equation of (a) the line that is tangent to and (b) the line that is normal to each of the following functions at the point on the graph with the given x-coordinate. If any line is oblique, give its slope-intercept equation. Show your work and your solutions neatly organized.

1.  $f(x) = x^3 - 2x^2 - x + 1$  ;  $x = 2$

(a) \_\_\_\_\_

(b) \_\_\_\_\_

2.  $f(x) = 2x^2 + x - 5$  ;  $x = -1$

(a) \_\_\_\_\_

(b) \_\_\_\_\_

3.  $f(x) = \sqrt[3]{x}$  ;  $x = 8$

(a) \_\_\_\_\_

(b) \_\_\_\_\_

4.  $f(x) = \frac{x^2 + 2x - 1}{3x}$  ;  $x = -1$

(a) \_\_\_\_\_

(b) \_\_\_\_\_

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Write the equation of any line that contains the given point and is tangent to the given function. Give the point of tangency with each equation.

5.  $(0, -2)$  ;  $f(x) = x^2 + 6x + 7$

6.  $(-1, 1)$  ;  $f(x) = x^3 - 2x - 1$

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Find the acute angle between the given functions at each point where they intersect.  
Round your answers to three significant figures.

7.  $y = x^2 - 4x + 1$   
 $y = -2x + 4$

8.  $y = x^3 - x^2 + 2$   
 $y = x^2 + 3x + 2$

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Solve the following problems. Show your work neatly organized in the space provided. Express irrational solutions rounded to three significant digits.

9. A rectangular bin is to be built that is twice as long as it is wide and has a capacity of 243 cubic feet. If the material for the top costs 30 cents per square foot, the material for the sides cost 50 cents per square foot, and the material for the bottom costs 70 cents per square foot, then what dimensions will minimize the total cost of the materials?

10. A manufacturer finds that if he produces  $n$  items per week, his total profit,  $P$ , (in dollars) is given by the function  $P = 45n - .25n^2 - 400$ . Find the weekly production,  $n$ , that corresponds to the maximum profit per item. What is the maximum profit per item?