

**A.P. Calculus AB 2.2-2.5 Review Session Problems (WS #4)**

1) Consider the curve given by  $x^2 - xy + y^2 = 4$ .

a) Find the two points on the curve at  $x = 0$

b) Find  $\frac{dy}{dx}$  by differentiating implicitly.

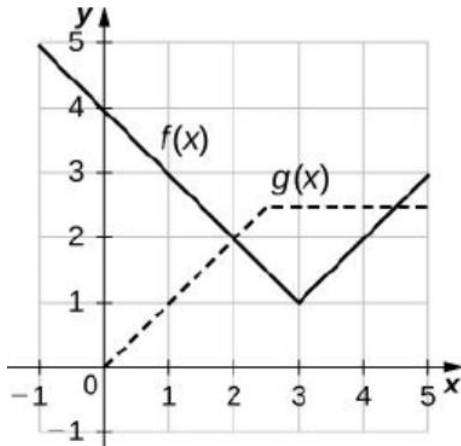
c) Use  $\frac{dy}{dx}$  to find the slope of the lines tangent to the curve at the points found in part a.

d) Write the equations of the line tangent to the curve at the points above.

e) Set up and write the equations (don't solve) in order to find vertical and horizontal tangents to this graph curve.

- 2) If  $g$  is differentiable everywhere and  $g(x) = \begin{cases} 6x^3 - 8x^2 + 8, & x < -2 \\ ax + b, & x \geq -2 \end{cases}$ , find  $a$  and  $b$   
(Involve derivatives in your work)

3)



a) If  $h(x) = f(x) \cdot g(x)$ , find  $h'(2)$

b) If  $w(x) = f(g(x))$ , find  $w'(3)$

c) If  $z(x) = 2[f(x)]^3$  find  $z'(0)$

d) If  $k(x) = f(f(x))$ , find  $k'(4)$

e) If  $p(x) = \frac{g(x)}{f(x)}$  find  $p'(1)$

- 4) Find  $\frac{dy}{dx}$  for  $y = 2 \left( \frac{5x^3 - 2}{3 - x^2} \right)^7$  (Write derivative as a simplified rational expression)

5) A particle moves along a straight line according to the given equation:  $x(t) = \frac{t^4}{4} - t^3 - 2t^2 + 1$ , for all real numbers in **meters per minute**

a) Find the velocity and acceleration function

b) Find when the particle changes direction (justify with because statement)

c) Determine interval when particle is moving left (justify with because statement)

d) Determine interval when particle is moving left (justify with because statement)

e) Find the average velocity of particle in interval  $[1, 3]$  (show work, include units)

f) Find the average acceleration of particle in interval  $[1, 3]$  (show work, include units)

g) Find particle's displacement from  $t = 1$  to  $t = 6$  (Show your work)

h) Find particle's distance from  $t = 1$  to  $t = 6$  (Show your work)

i) At  $t = 2$ , is the speed increasing or decreasing? Provide justification for your answer.

j) At  $t = 5$ , is the velocity increasing or decreasing? Provide justification for your answer.