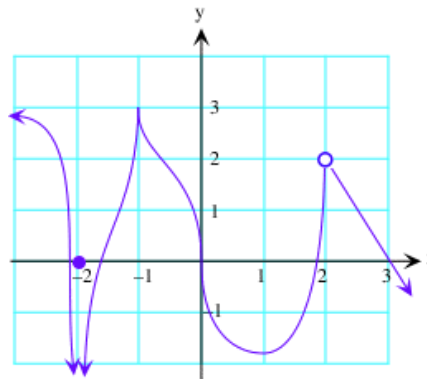


**Unit 2 Review**

Name: \_\_\_\_\_

**Knowledge and Understanding**

Use the sketch of  $f(x)$  for questions 1, 2 & 3.



- List the places where  $f(x)$  is not differentiable. \_\_\_\_\_
- Where is  $f(x)$  not differentiable because  $f(x)$  is vertical? \_\_\_\_\_
- For each section place the corresponding letter on the blank.  
 A)  $< 0$       B)  $= 0$       C)  $> 0$       D) Does Not Exist  
 a)  $f(1)$  \_\_\_\_\_    b)  $f'(3)$  \_\_\_\_\_    c)  $f'(-0.5)$  \_\_\_\_\_    d)  $f''(1)$  \_\_\_\_\_

- State the Product Rule. \_\_\_\_\_
- If  $y = 5x^2 - 3x + 10$ , give  $y'(-1)$
- If  $f(2) = -3$ ,  $f'(2) = 10$ ,  $g(2) = 4$ , and  $g'(2) = 1$ , then evaluate  $(fg)'$  at  $x = 2$ .
- The limit gives the slope of the tangent to some function,  $f(x)$  at some point  $x = a$ .

$$m = \lim_{\Delta x \rightarrow 0} \frac{2(3 + \Delta x)^3 - 54}{\Delta x} \quad f(x) = \text{_____} \quad a = \text{_____}$$

8. Differentiate the following. Do Not Simplify.

a)  $y = \sqrt[5]{5x^3 - 3x(5 - 4x)^3}$     b)  $y = \frac{6x - x^2}{\sqrt{1 - 3x}}$     c)  $y = \frac{(x^4 - 5)^7}{(6x^2 - 3)(5x + 3)^8}$

9. From "First Principles" show that if  $f(x) = \frac{1}{x^2 - 3}$ , then  $f'(x) = \frac{-2x}{(x^2 - 3)^2}$  [4]

3. Find the equations of the tangents to  $y = 2x^3 - 16$  at the points where the curve touches the x-axis. [5]

**APPS**

- An astronaut conducting an intergalactic experiment on planet Adrock launches a small ball into the air off the edge of a short cliff. The height of the ball from the ground below is given by  $h(t) = 10 + 18t - 3t^2$ , for any value of  $t \geq 0$ . (t in seconds, h in m)
  - How tall is the cliff?
  - What is the velocity at 1.5s?
  - When does the ball reach its maximum height?
  - What is the maximum height of the ball?
  - When will the ball land on the ground?
  - (Bonus)** Is the planet Adrock larger or smaller than earth? **WHY?**

2. A manufacturer of CD players estimates that the cost of making  $x$  machines is

$$C(x) = 87\,000 + 122x \quad \text{and the demand (price) function is } p(x) = \frac{600\,000 - x}{1000}$$

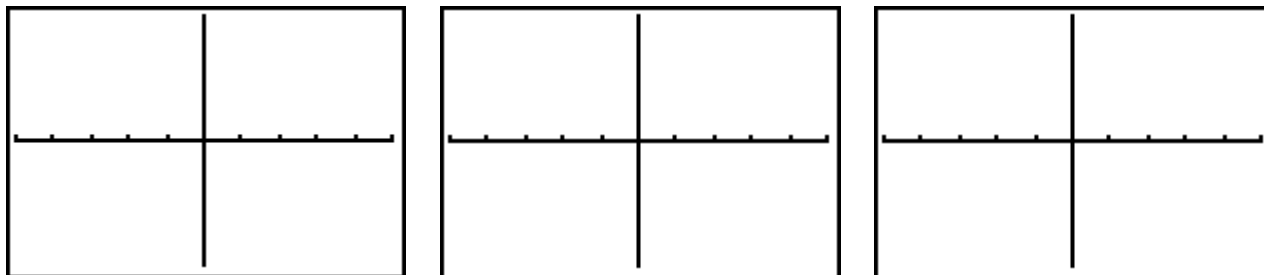
- What is the revenue function?
- What is the marginal (ROC) revenue if the manufacturer sells 250 000 players?
- What is the actual revenue of the 250 000<sup>th</sup> CD player sold? (between 250000 and 250001)
- What profit will the manufacturer make if she sells 2500 000 players?
- What is the marginal (ROC) profit if she sells 250 000 players? Should she make more or less than 250 000 CD players? Why?

**Communication**

1. Each of the following functions is defined at  $x = 3$  but not differentiable at  $x = 3$ . Clearly explain why each function is not differentiable there.

a)  $f(x) = \sqrt{3 - x}$       b)  $f(x) = (x - 3)^{\frac{1}{3}}$       c)  $f(x) = |x - 3|$

The best explanations will involve graphical and algebraic reasoning.



**TIPS :**

- Determine the equation(s) of the tangent(s) to the curve  $y = 10x - x^2 - 16$ , from (1, 18).
- The line  $y + 2x = 0$  is tangent to  $y = F(x)$ . Determine  $F(x)$  if  $F'(x) = 4x^3 + 2$ .