Basic Calculus | 4th Quarter

Activity 2: Final Activity

April 1 2021 (Happy April Fools!)

Solve each problem. Show your solution. (5 pts each)

1. What is $f'''(x)$ if $f'(x)=x^2-\frac{1}{3}x$.

   $f''(x)=2x-\frac{1}{3}$

   $f'''(x)=2$

2. Find the derivative of $\frac{2x-5y^2}{4y^3-x^2}=-x$ at $(1,1)$.

   $\frac{2-10y}{12y^2-2x}=-1$

   $2-10y=-(12y^2-2x)$

   $2-10y=2x-12y^2$

   $2-2x=10y-12y^2$

   $2-2x=10y\frac{dy}{dx}-12y^2\frac{dy}{dx}$

   $2-2x=\frac{dy}{dx}(10y-12y^2)$

   $\frac{2-2x}{10y-12y^2}=\frac{dy}{dx}$

   $\frac{2-2(1)}{10(1)-12(1)^2}=\frac{dy}{dx}$

   $\frac{0}{10-12}=\frac{dy}{dx}$

   $slope=\frac{dy}{dx}=0$

3. Assuming that one of the sides of a rectangular field is a river bank and no fencing is needed along the bank, what are the dimensions of a rectangular field with the maximum area that can be fenced off using 50m of fencing materials?

   $Perimeter=2L+2W$

   $P=2(L+W)$

   $50=2(x+y)$

   $\frac{50}{2}=\frac{2(x+y)}{2}$

   $25=x+y$

   $y=25-x$

   $Area=L\cdot W$

   $A=x\cdot y$

   $A=x(25-x)$

   $A=25x-x^2$

$$\frac{dy}{dx}=25-2x$$
$$0=25-2x$$
$$\frac{2x}{2}=\frac{25}{2}$$
$$x=\frac{25}{2}$$

$$y=25-(\frac{25}{2})$$
$$y=\frac{25}{2}$$

$$\frac{dy}{dx}=25-2x$$
$$\frac{d^2y}{dx^2}=-2$$ where if $$\frac{d^2y}{dx^2}<0$$ then critical value is maximum.

Therefore, $L=\frac{25}{2}, W=\frac{25}{2}$ are the maximum dimensions of a rectangular field that have a perimeter of 50m.