2. Find $\left.\dfrac{d^2y}{dx^2}\right|_{(x,y)=(\pi/6\,,\,\pi/3)}$ if y is a differentiable function of x satisfying the equation:

$$y\sin(2y-x)=2x$$

$$\Big\Downarrow \; d/dx$$

$$y'\sin(2y-x)+y\cos(2y-x)\cdot(2y'-1)=2$$

$$\Big\Downarrow \longleftarrow \boxed{(x,y)=\left(\tfrac{\pi}{6},\tfrac{\pi}{3}\right)}$$

$$y'\underbrace{\sin\tfrac{\pi}{2}}_{1}+\tfrac{\pi}{3}\underbrace{\cos\tfrac{\pi}{2}}_{0}\cdot(2y'-1)=2$$

$$\Big\Downarrow$$

$$y'=2 \text{ at } (x,y)=\left(\tfrac{\pi}{6},\tfrac{\pi}{3}\right)$$

$$\Big\Downarrow \; d/dx$$

$$y''\sin(2y-x)+y'\cos(2y-x)\cdot(2y'-1)$$
$$+\,y'\cos(2y-x)\cdot(2y'-1)+y\cdot(-\sin(2y-x))\cdot(2y'-1)^2$$
$$+\,y\cos(2y-x)\cdot 2y''=0$$

$$\Big\Downarrow \longleftarrow \boxed{(x,y)=\left(\tfrac{\pi}{6},\tfrac{\pi}{3}\right),\ y'=2}$$

$$y''\underbrace{\sin\tfrac{\pi}{2}}_{1}+2\underbrace{\cos\tfrac{\pi}{2}}_{0}\cdot(2\cdot2-1)+2\underbrace{\cos\tfrac{\pi}{2}}_{0}\cdot(2\cdot2-1)+\tfrac{\pi}{3}\cdot\Big(-\underbrace{\sin\tfrac{\pi}{2}}_{1}\Big)\cdot(2\cdot2-1)^2+\tfrac{\pi}{3}\underbrace{\cos\tfrac{\pi}{2}}_{0}\cdot2y''=0$$

$$\Big\Downarrow$$

$$y''=3\pi \text{ at } (x,y)=\left(\tfrac{\pi}{6},\tfrac{\pi}{3}\right)$$