SOLUTIONS

King Fahd University of Petroleum & Minerals

Department of Mathematics & Statistics -**Math101-Term072-Quiz3-A**

Name: ID: Sec.: Serial:

Q.1 If $f'(1)=5, g'(1)=-3, f(1)=6, g(1)=-4$, then find $\lim_{h\to 0}\left(\frac{f(1+h)g(1+h)-f(1)g(1)}{h}\right)$ if exists.

$$\lim_{h\to 0}\left(\frac{f(1+h)g(1+h)-f(1)g(1)}{h}\right)=(f.g)'(1) \quad \textbf{(3-Points)}$$

$$=f(1).g'(1)+g(1).f'(1)=(6)(-3)+(-4).(5) \quad \textbf{(2-Points)}$$

$$=-18-20=-38 \ \textbf{(1-Point)}$$

Q2. A particle moves on a vertical line so that its coordinate at time t is $S=t^3-12t+3,\ t\ge 0$ where t in seconds, and S in meters, then

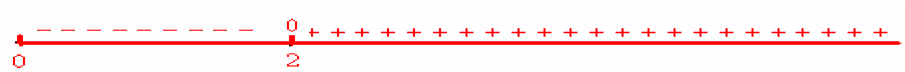
a. Find the distance moved when the velocity is $15\ m/s$

$v(t)=S'(t)=3t^2-12.$ $Set\ v(t)=15 \Rightarrow 3t^2-12=15 \Rightarrow 3t^2=27 \Rightarrow t^2=9 \Rightarrow t=+\sqrt{9}=3$ **(2-Pts)**

The distance $=S(3)=(3)^3-12(3)+3=-6m$ **(1-Point)**

b. When is the particle moving upward and when it is moving downward?

$Set\ v(t)=0 \Rightarrow 3t^2-12=0 \Rightarrow 3t^2=12 \Rightarrow t^2=4 \Rightarrow t=+\sqrt{4}=2$ **(1-Point)**



It is moving upward when $t>2\ or\ (2,\infty)$, **and downward when** $0\le t<2\ or\ [0,2)$ **(2-Points)**

Q3. Find the points on the curve $y=\frac{\cos(x)}{2+\sin(x)}$ at which the tangent is horizontal.

$$y'=\frac{(2+\sin(x))(-\sin(x))-\cos(x)(\cos(x))}{(2+\sin(x))^2}=\frac{-2\sin(x)-\sin^2(x)-\cos^2(x)}{(2+\sin(x))^2}=\frac{-2\sin(x)-1}{(2+\sin(x))^2} \quad \textbf{(2-Pts)}$$

Set $y'=0 \Rightarrow \frac{-2\sin(x)-1}{(2+\sin(x))^2}=0 \Rightarrow -2\sin(x)-1=0 \Rightarrow \sin(x)=-\frac{1}{2}$

$\Rightarrow x=\frac{7\pi}{6}+2n\pi\ \ or\ \ x=\frac{11\pi}{6}+2n\pi$ **Where** n **is an integer. (2-Points)**

The points are: $x=\frac{7\pi}{6}+2n\pi \Rightarrow y=\frac{-\sqrt{3}/2}{2+\left(-1/2\right)}=\frac{-\sqrt{3}/2}{3/2}=\frac{-\sqrt{3}}{3} \Rightarrow \left(\frac{7\pi}{6}+2n\pi,\frac{-\sqrt{3}}{3}\right)$ **(2-Pts)**

$x=\frac{11\pi}{6}+2n\pi \Rightarrow y=\frac{\sqrt{3}/2}{2+\left(-1/2\right)}=\frac{\sqrt{3}/2}{3/2}=\frac{\sqrt{3}}{3} \Rightarrow \left(\frac{11\pi}{6}+2n\pi,\frac{\sqrt{3}}{3}\right)$ **(2-Points)**