	BCM SCHOOL BASANT AVENUE DUGRI ROAD LUDHIANA **CLASS XI(MATHS ASSIGNMENT)** ANSWER KEY	
1	$\lim_{x \to \frac{\pi}{2}} \frac{1-\sin x}{\cos x}$ is equal to 1. 0 2. -1 3. 1 4. does not exit ANS: 0	
2	$\lim_{x \to 0} \frac{\sin x}{\sqrt{x+1}-\sqrt{1-x}}$ is equal to 1. 2 2. 0 3. 1 4. -1 ANS: 1	
3	**Differentiate $\sin^3 x \cos^3 x$ w.r.t x** **ANS:** $\frac{dy}{dx} = \cos^3 x \frac{d}{dx}(\sin^3 x) + \sin^3 x \frac{d}{dx}(\cos^3 x)$ $\Rightarrow \frac{dy}{dx} = \cos^3 x(3\sin^2 x \cos x)$ $+ \sin^3 x(3\cos^2 x \cdot (-\sin x))$ $\Rightarrow \frac{dy}{dx} = 3\sin^2 x. \cos^4 x - 3\cos^2 x. \sin^4 x$ $\Rightarrow \frac{dy}{dx} = 3\sin^2 x. \cos^2 x(\cos^2 x - \sin^2 x)$	
4	**Find the derivative of $f(x) = \sqrt{\sin x}$, by first principle.** **ANS:**	

$$f'(x) = \lim_{h\to 0} \frac{\sqrt{\sin(x+h)} - \sqrt{\sin x}}{h}$$

$$= \lim_{h\to 0} \frac{\sqrt{\sin(x+h)} - \sqrt{\sin x}}{h} \cdot \frac{\sqrt{\sin(x+h)} + \sqrt{\sin x}}{\sqrt{\sin(x+h)} + \sqrt{\sin x}}$$

$$= \lim_{h\to 0} \frac{\sin(x+h) - \sin x}{h\left(\sqrt{\sin(x+h)} + \sqrt{\sin x}\right)}$$

$$f'(x) = \lim_{h\to 0} \frac{\sin x \cos h + \cos x \sin h - \sin x}{h\left(\sqrt{\sin(x+h)} + \sqrt{\sin x}\right)}$$

$$= \lim_{h\to 0} \frac{\sin x(\cos h - 1) + \cos x \sin h}{h\left(\sqrt{\sin(x+h)} + \sqrt{\sin x}\right)}$$

$$= \lim_{h\to 0} \frac{\sin x(\cos h - 1)}{h\left(\sqrt{\sin(x+h)} + \sqrt{\sin x}\right)} + \frac{\cos x \sin h}{h\left(\sqrt{\sin(x+h)} + \sqrt{\sin x}\right)}$$

$$= \lim_{h\to 0} \frac{\cos h - 1}{h} \frac{\sin x}{\sqrt{\sin(x+h)} + \sqrt{\sin x}}$$

$$+ \frac{\sin h}{h} \frac{\cos x}{\sqrt{\sin(x+h)} + \sqrt{\sin x}}$$

$$f'(x) = 0 \times \frac{\sin x}{\sqrt{\sin(x)} + \sqrt{\sin x}} + 1 \times \frac{\cos x}{\sqrt{\sin(x)} + \sqrt{\sin x}}$$

$$= \frac{\cos x}{2\sqrt{\sin(x)}}$$

5 Evaluate: $\lim_{x\to 0} \frac{\sqrt{1+x^3} - \sqrt{1-x^3}}{x^2}$

ANS:

	Given that $\lim_{x\to 0} \frac{\sqrt{1+x^3}-\sqrt{1-x^3}}{x^2}$ Rationalizing the Numerator and denominator, $= \lim_{x\to 0} \frac{[\sqrt{1+x^3}-\sqrt{1-x^3}][\sqrt{1+x^3}+\sqrt{1-x^3}]}{x^2[\sqrt{1+x^3}+\sqrt{1-x^3}]}$ $= \lim_{x\to 0} \frac{(1+x^3)-(1-x^3)}{x^2[\sqrt{1+x^3}+\sqrt{1-x^3}]}$ $= \lim_{x\to 0} \frac{1+x^3-1+x^3}{x^2[\sqrt{1+x^3}+\sqrt{1-x^3}]}$ $= \lim_{x\to 0} \frac{2x^3}{x^2[\sqrt{1+x^3}+\sqrt{1-x^3}]} = \lim_{x\to 0} \frac{2x}{\sqrt{1+x^3}+\sqrt{1-x^3}} = 0$	
6	**Differentiate (3x + 5)(1 + tan x) w.r.t to x** **ANS:** $\frac{dy}{dx} = \frac{d}{dx}[(3x+5)(1+\tan x)]$ $\Rightarrow \frac{dy}{dx} = (3x+5)\frac{d}{dx}(1+\tan x)$ $+(1+\tan x)\frac{d}{dx}(3x+5)$ $\left[\because \frac{d(u\cdot v)}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}\right]$ $\Rightarrow \frac{dy}{dx} = (3x+5)\left[\frac{d(1)}{dx} + \frac{d(\tan x)}{dx}\right] +$ $(1+\tan x)\left[\frac{d(3x)}{dx} + \frac{d(5)}{dx}\right]$ $\left[\because \frac{d(f+g)}{dx} = \frac{df}{dx} + \frac{dg}{dx}\right]$ $\Rightarrow \frac{dy}{dx} = (3x+5)(0+\sec^2 x) + (1+\tan x)(3+0)$	
7	**Evaluate** $\lim_{h\to 0} \frac{(a+h)^2 \sin(a+h) - a^2 \sin a}{h}$ **Ans.** $\lim_{h\to 0} \frac{(a+h)^2 \sin(a+x) - a^2 \sin a}{h}$ $= \lim_{h\to 0} \frac{(a^2+2ah+h^2)\sin(a+h) - a^2 \sin a}{h}$ $= \lim_{h\to 0} \frac{a^2 \sin(a+h) + 2ah\sin(a+h) + h^2 \sin(a+h) - a^2 \sin a}{h}$ $= \lim_{h\to 0} \frac{a^2[\sin(a+h) - \sin a] + 2ah\sin(a+h) + h^2 \sin(a+h)}{h}$	

	$= \lim_{h\to 0} \frac{a^2 2\cos\left[\frac{2a+h}{2}\right]\sin\frac{h}{2}}{2\frac{h}{2}} + \lim_{h\to 0} 2a\sin(a+h) + \lim_{h\to 0} h\sin(a+h)$ $= a^2\cos\left[\frac{2a+0}{2}\right]\times 1 + 2a\sin[a+0] + 0\times\sin a$ $= a^2\cos a + 2a\sin a$	