AP CALCULUS BC
Summer Assignment

The following questions are intended to review some of the necessary skills you will need to enter AP Calculus BC. Solve each of them in a separate piece of paper showing ALL WORK. We will go over all of them at the beginning of the course, but a grade will be given to those who has completed them in advance. Answers Key is attached along with this assignment to verify your solutions. Good Luck.

1. Evaluate the following derivatives

(a) $\frac{d}{dx}(2x\sqrt{x^2-2x+2})$ **(b)** $\frac{d}{dt}(5t^2\sin t)$

(c) $\frac{d}{dx}(5x+\sin^3 x+\sin x^3)$ **(d)** $\frac{d}{d\theta}(4\tan(\theta^2+3\theta+2))$

(e) $\frac{d}{du}\left(\frac{4u^2+u}{8u+1}\right)$ **(f)** $\frac{d}{d\theta}(\tan(\sin\theta))$

(g) $\frac{d}{dx}\left(-\frac{sinx}{1+cosx}\right)$ **(h)** $\frac{d}{dx}(sin^{-1}(lnx))$

(i) $\frac{d}{dx}(e^{x^4}ln(lnx))$ **(j)** $\frac{d}{dx}(2^{x^3+4x-1})$

(k) $\frac{d}{dy}(tan^{-1}(2y^2-4))$ **(l)** $\frac{d}{dx}(sin^{-1}(cosx))$

2. Find the **slope** of the **tangent line** to the graph of $y=tan^{-1}(3x)$ at $x = 1/3$.

3. Find an equation of the line that is tangent to the graph of **(a)** $f(x)=cos^{-1}(x^2)$ at $(1/\sqrt{2},\pi/3)$; **(b)** $f(x)=\frac{lnx}{x}$ at $x=e$; **(c)** $f(x)=xarcsinx$ at $x=\frac{1}{2}$.

4. Find an equation of the line tangent to the following curves at the given points.

(a) $y=3x^3+\sin x;(0,0)$ **(b)** $y=\frac{4x}{x^2+3};(3,1)$

(c) $y+\sqrt{xy}=6;(1,4)$ **(d)** $x^2y+y^3=75;(4,3)$

5. Consider the curve given by $x^2+2y^2+xy=12$. **(a)** Find $\frac{dy}{dx}$. **(b)** Find the points on the curve where the tangent lines are horizontal. **(c)** Find the points on the curve where the tangent lines are vertical.

6. Consider the curve given by $x^2+3y+2y^2=48$. **(a)** Find $\frac{dy}{dx}$. **(b)** Use the tangent line to the curve at (2,4) to approximate the y-coordinate of the point where $x=3$. **(c)** For $t\geq 0$, a particle is moving along the curve $y^3+2xy=24$. At the instant the particle is at the point (4,2), the y-coordinate of the particle's position is decreasing at a rate of 2 units per second. At that instant, what is the rate of change of the x-coordinate of the particle's position with respect to the time?

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ANSWER KEY

1. (a) $\frac{dy}{dx}=\frac{4x^2-6x+4}{\sqrt{x^2-2x+2}}$ (b) $\frac{dy}{dt}=5t(2sint+tcost)$

(c) $\frac{dy}{dx}=5+3sin^2xcosx+3x^2cosx^3$

(d) $\frac{dy}{d\theta}=4(2\theta+3)sec^2(\theta^2+3\theta+2)$

(e) $\frac{dy}{du}=\frac{32u^2+8u+1}{(8u+1)^2}$ (f) $\frac{dy}{d\theta}=cos\theta sec^2(sin\theta)$

(g) $\frac{dy}{dx}=-\frac{1}{cosx+1}$ (h) $\frac{dy}{dx}=\frac{1}{x\sqrt{1-(lnx)^2}}$

(i) $\frac{dy}{dx}=e^{x^4}\left(4x^3\ln(lnx)+\frac{1}{xlnx}\right)$

(j) $\frac{dy}{dx}=(ln2)(3x^2+4)2^{x^3+4x-1}$

(k) $\frac{df(y)}{dy}=\frac{4y}{1+(2y^2-4)^2}$ (l) $\frac{dy}{dx}=-1\ or\ 1$

2. $\frac{3}{2}$

3. (a) $L(x)=\frac{\pi}{3}-\frac{4}{\sqrt{6}}\left(x-\frac{1}{\sqrt{2}}\right)$

(b) $L(x)=\frac{1}{e}+0(x-e)\ or\ L(x)=\frac{1}{e}$

(c) $L(x)=\frac{\pi}{12}+\frac{1}{\sqrt{3}}\left(x-\frac{1}{2}\right)$

4. (a) $L(x)=x$ (b) $L(x)=1-\frac{1}{6}(x-3)$

(c) $L(x)=4-\frac{4}{5}(x-1)$

(d) $L(x)=3-\frac{24}{43}(x-4)$

5. (a) $\frac{dy}{dx}=\frac{-2x-y}{4y+x}$

(b) $\left(\sqrt{\frac{12}{7}},-2\sqrt{\frac{12}{7}}\right),\left(-\sqrt{\frac{12}{7}},2\sqrt{\frac{12}{7}}\right)$

(c) $\left(-4\sqrt{\frac{6}{7}},\sqrt{\frac{6}{7}}\right),\left(4\sqrt{\frac{6}{7}},-\sqrt{\frac{6}{7}}\right)$

6. (a) $\frac{dy}{dx}=-\frac{2x}{4y+3}$ (b) $\frac{72}{19}$ (c) $\frac{dx}{dt}=\frac{5}{2}$