**Name: _____ #: _____ Date: _____ Period: _____**

AP Calculus AB

*Trigonometry Review and Application*

Be sure to *show your work* wherever possible. NO CALCULATORS are necessary for this.

1. $\cos(x) = \sin(\ ?\ )$

2. Multiply every term in the equation $1 + \cot^2 x = \csc^2 x$ by $\sin^2 x$. Simplify. How is the new equation related to the coordinates of a point on the unit circle?

3. Show that $\frac{d}{dx}(\sec x) = \sec(x)\tan(x)$ using only the derivative of cosine.

4. Is the trigonometric function in the brackets positive or negative?

| | | |
|---|---|---|
| a) $\sin(-x) = [\ ?\ \sin(x)]$ | b) $\tan(-x) = [\ ?\ \tan(x)]$ | c) $\sec(-x) = [\ ?\ \sec(x)]$ |
| d) $\cot(-x) = [\ ?\ \cot(x)]$ | e) $\csc(-x) = [\ ?\ \csc(x)]$ | f) $\cos(-x) = [\ ?\ \cos(x)]$ |

5. Restrict the <u>range</u> of the following trigonometric relations to make them functions. (Principle branches)

a) $y = \arcsin(x)$ b) $y = \arccos(x)$ c) $y = \arctan(x)$

Back to the AP Exam:
Answer each question and provide a *justification* for your answer. Years for each question are given.

1993

13. The fundamental period of $2\cos(3x)$ is

(A) $\frac{2\pi}{3}$ (B) $2\pi$ (C) $6\pi$ (D) 2 (E) 3

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*Justification:*

1988

32. Which of the following does NOT have a period of $\pi$ ?

(A) $f(x)=\sin\left(\frac{1}{2}x\right)$ (B) $f(x)=|\sin x|$ (C) $f(x)=\sin^2 x$

(D) $f(x)=\tan x$ (E) $f(x)=\tan^2 x$

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*Justification:*

1988

35. $4\cos\left(x+\frac{\pi}{3}\right)=$

(A) $2\sqrt{3}\cos x-2\sin x$ (B) $2\cos x-2\sqrt{3}\sin x$ (C) $2\cos x+2\sqrt{3}\sin x$

(D) $2\sqrt{3}\cos x+2\sin x$ (E) $4\cos x+2$

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*Justification:*

1993

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12. The position of a particle moving along the $x$-axis is $x(t)=\sin(2t)-\cos(3t)$ for time $t\geq 0$. When $t=\pi$, the acceleration of the particle is

(A) 9 (B) $\frac{1}{9}$ (C) 0 (D) $-\frac{1}{9}$ (E) –9

*Justification:*

1997

79. The position of an object attached to a spring is given by $y(t) = \frac{1}{6}\cos(5t) - \frac{1}{4}\sin(5t)$, where $t$ is time in seconds. In the first 4 seconds, how many times is the velocity of the object equal to 0?

(A) Zero
(B) Three
(C) Five
(D) Six
(E) Seven

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*Justification:*

1988

29. The $\lim_{h \to 0} \frac{\tan 3(x+h) - \tan 3x}{h}$ is

(A) 0 (B) $3\sec^2(3x)$ (C) $\sec^2(3x)$ (D) $3\cot(3x)$ (E) nonexistent

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*Justification:*

1993

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29. $\lim_{\theta \to 0} \frac{1 - \cos\theta}{2\sin^2\theta}$ is

(A) 0 (B) $\frac{1}{8}$ (C) $\frac{1}{4}$ (D) 1 (E) nonexistent

*Justification:*

1993

10. If $f(x) = (x-1)^2 \sin x$, then $f'(0) =$

(A) $-2$ (B) $-1$ (C) $0$ (D) $1$ (E) $2$

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*Justification:*

1993

8. If $y = \tan x - \cot x$, then $\frac{dy}{dx} =$

(A) $\sec x \csc x$ (B) $\sec x - \csc x$ (C) $\sec x + \csc x$ (D) $\sec^2 x - \csc^2 x$ (E) $\sec^2 x + \csc^2 x$

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*Justification:*

1997

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7. $\frac{d}{dx}\cos^2(x^3) =$

(A) $6x^2 \sin(x^3)\cos(x^3)$

(B) $6x^2 \cos(x^3)$

(C) $\sin^2(x^3)$

(D) $-6x^2 \sin(x^3)\cos(x^3)$

(E) $-2\sin(x^3)\cos(x^3)$

*Justification:*

1997

10. An equation of the line tangent to the graph of $y = \cos(2x)$ at $x = \frac{\pi}{4}$ is

(A) $y - 1 = -\left(x - \frac{\pi}{4}\right)$

(B) $y - 1 = -2\left(x - \frac{\pi}{4}\right)$

(C) $y = 2\left(x - \frac{\pi}{4}\right)$

(D) $y = -\left(x - \frac{\pi}{4}\right)$

(E) $y = -2\left(x - \frac{\pi}{4}\right)$

*Justification:*

1988

4. If $u$, $v$, and $w$ are nonzero differentiable functions, then the derivative of $\frac{uv}{w}$ is

(A) $\frac{uv' + u'v}{w'}$ (B) $\frac{u'v'w - uvw'}{w^2}$ (C) $\frac{uvw' - uv'w - u'vw}{w^2}$

(D) $\frac{u'vw + uv'w + uvw'}{w^2}$ (E) $\frac{uv'w + u'vw - uvw'}{w^2}$

*Justification:*