Chapter 1 – AP Calc MC Questions

TRIGONOMETRIC FUNCTIONS

28. The function defined by $f(x)=\sqrt{3}\cos x+3\sin x$ has an amplitude of

(A) $3-\sqrt{3}$ (B) $\sqrt{3}$ (C) $2\sqrt{3}$ (D) $3+\sqrt{3}$ (E) $3\sqrt{3}$

C

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44. The fundamental period of the function defined by $f(x)=3-2\cos^2\frac{\pi x}{3}$ is

(A) 1 (B) 2 (C) 3 (D) 5 (E) 6

C

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29. Let $f(x)=\left|\sin x-\frac{1}{2}\right|$. The maximum value attained by f is

(A) $\frac{1}{2}$ (B) 1 (C) $\frac{3}{2}$ (D) $\frac{\pi}{2}$ (E) $\frac{3\pi}{2}$

C

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24. Let $f(x)=\cos(\arctan x)$. What is the range of f?

(A) $\left\{x\middle|-\frac{\pi}{2}<x<\frac{\pi}{2}\right\}$ (B) $\{x|0<x\le 1\}$ (C) $\{x|0\le x\le 1\}$

(D) $\{x|-1<x<1\}$ (E) $\{x|-1\le x\le 1\}$

B

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32. Which of the following does NOT have a period of π ?

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

A

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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) $4\cos x+2$

B

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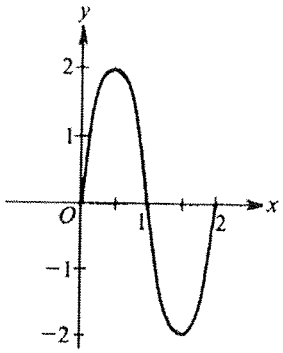
13. The fundamental period of $2\cos(3x)$ is

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

A



D

35. The figure above shows the graph of a sine function for one complete period. Which of the following is an equation for the graph?

(A) $y = 2\sin\left(\frac{\pi}{2}x\right)$ (B) $y = \sin(\pi x)$ (C) $y = 2\sin(2x)$

(D) $y = 2\sin(\pi x)$ (E) $y = \sin(2x)$

EVEN AND ODD FUNCTIONS

1. Which of the following defines a function f for which $f(-x) = -f(x)$?

(A) $f(x) = x^2$ (B) $f(x) = \sin x$ (C) $f(x) = \cos x$

(D) $f(x) = \log x$ (E) $f(x) = e^x$

B

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7. Which of the following equations has a graph that is symmetric with respect to the origin?

(A) $y = \dfrac{x+1}{x}$ (B) $y = -x^5 + 3x$ (C) $y = x^4 - 2x^2 + 6$

(D) $y = (x-1)^3 + 1$ (E) $y = \left(x^2 + 1\right)^2 - 1$

B

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26. The graph of $y^2 = x^2 + 9$ is symmetric to which of the following?

I. The x-axis
II. The y-axis
III. The origin

(A) I only (B) II only (C) III only (D) I and II only (E) I, II, and III

E

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44. Let f and g be odd functions. If p, r, and s are nonzero functions defined as follows, which must be odd?

I. $p(x) = f(g(x))$
II. $r(x) = f(x) + g(x)$
III. $s(x) = f(x)g(x)$

(A) I only (B) II only (C) I and II only

(D) II and III only (E) I, II, and III

C

INVERSE FUNCTIONS

10. The set of all points (e^t, t), where t is a real number, is the graph of $y =$

E

(A) $\frac{1}{e^x}$ (B) $e^{\frac{1}{x}}$ (C) $xe^{\frac{1}{x}}$ (D) $\frac{1}{\ln x}$ (E) $\ln x$

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14. If the function f is defined by $f(x) = x^5 - 1$, then f^{-1}, the inverse function of f, is defined by $f^{-1}(x) =$

E

(A) $\frac{1}{\sqrt[5]{x+1}}$ (B) $\frac{1}{\sqrt[5]{x+1}}$ (C) $\sqrt[5]{x-1}$

(D) $\sqrt[5]{x}-1$ (E) $\sqrt[5]{x+1}$

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19. Suppose that f is a function that is defined for all real numbers. Which of the following conditions assures that f has an inverse function?

D

(A) The function f is periodic.
(B) The graph of f is symmetric with respect to the y-axis.
(C) The graph of f is concave up.
(D) The function f is a strictly increasing function.
(E) The function f is continuous.

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31. If $f(x) = \frac{x}{x+1}$, then the inverse function, f^{-1}, is given by $f^{-1}(x) =$

C

(A) $\frac{x-1}{x}$ (B) $\frac{x+1}{x}$ (C) $\frac{x}{1-x}$ (D) $\frac{x}{x+1}$ (E) x

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DOMAIN & RANGE OF FUNCTIONS

14. If $f(x)=x^{\frac{1}{3}}(x-2)^{\frac{2}{3}}$ for all x, then the domain of f' is

(A) $\{x \mid x \neq 0\}$ (B) $\{x \mid x > 0\}$ (C) $\{x \mid 0 \leq x \leq 2\}$

(D) $\{x \mid x \neq 0 \text{ and } x \neq 2\}$ (E) $\{x \mid x \text{ is a real number}\}$

D

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15. The domain of the function defined by $f(x)=\ln\left(x^2-4\right)$ is the set of all real numbers x such that

(A) $|x|<2$ (B) $|x| \leq 2$ (C) $|x|>2$ (D) $|x| \geq 2$ (E) x is a real number

C

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21. If the domain of the function f given by $f(x)=\dfrac{1}{1-x^2}$ is $\{x:|x|>1\}$, what is the range of f?

(A) $\{x:-\infty<x<-1\}$ (B) $\{x:-\infty<x<0\}$ (C) $\{x:-\infty<x<1\}$

(D) $\{x:-1<x<\infty\}$ (E) $\{x:0<x<\infty\}$

B

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2. What is the domain of the function f given by $f(x)=\dfrac{\sqrt{x^2-4}}{x-3}$?

(A) $\{x: x \neq 3\}$ (B) $\{x: |x| \leq 2\}$ (C) $\{x: |x| \geq 2\}$

(D) $\{x: |x| \geq 2 \text{ and } x \neq 3\}$ (E) $\{x: x \geq 2 \text{ and } x \neq 3\}$

D

COMPOSITION OF FUNCTIONS

12. If $f(x)=\dfrac{4}{x-1}$ and $g(x)=2x$, then the solution set of $f(g(x))=g(f(x))$ is

(A) $\left\{\frac{1}{3}\right\}$ (B) $\{2\}$ (C) $\{3\}$ (D) $\{-1,2\}$ (E) $\left\{\frac{1}{3},2\right\}$

A

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2. If $f(x)=x^3+3x^2+4x+5$ and $g(x)=5$, then $g(f(x))=$

(A) $5x^2+15x+25$ (B) $5x^3+15x^2+20x+25$ (C) 1125
(D) 225 (E) 5

E

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9. If h is the function given by $h(x)=f(g(x))$, where $f(x)=3x^2-1$ and $g(x)=|x|$, then $h(x)=$

(A) $3x^3-|x|$ (B) $|3x^2-1|$ (C) $3x^2|x|-1$ (D) $3|x|-1$ (E) $3x^2-1$

E

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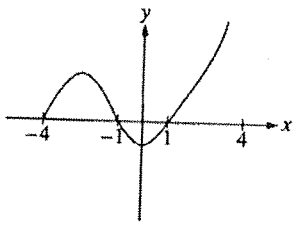
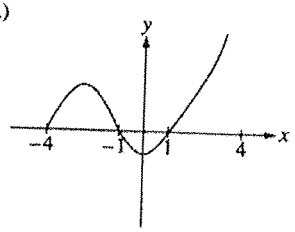
12. If $f(g(x))=\ln\left(x^2+4\right)$, $f(x)=\ln\left(x^2\right)$, and $g(x)>0$ for all real x, then $g(x)=$

(A) $\dfrac{1}{\sqrt{x^2+4}}$ (B) $\dfrac{1}{x^2+4}$ (C) $\sqrt{x^2+4}$ (D) x^2+4 (E) $x+2$

C



40. The graph of $y=f(x)$ is shown in the figure above. Which of the following could be the graph of $y=f(|x|)$?

(A)


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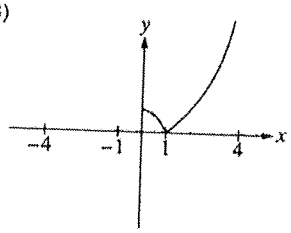
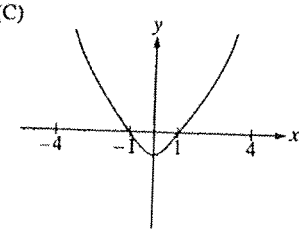


(C)


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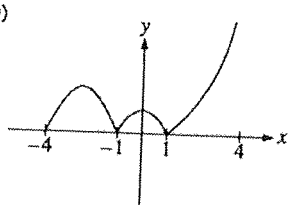
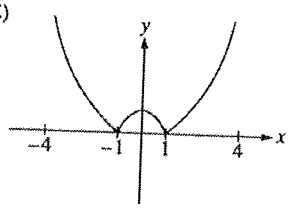


(E)


MISCELLANEOUS

2. $\ln(x-2)<0$ if and only if

C

(A) $x<3$ (B) $0<x<3$ (C) $2<x<3$

(D) $x>2$ (E) $x>3$

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8. If $p(x)=(x+2)(x+k)$ and if the remainder is 12 when $p(x)$ is divided by $x-1$, then $k=$

B

(A) 2 (B) 3 (C) 6 (D) 11 (E) 13

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32. If a,b,c,d, and e are real numbers and $a\neq 0$, then the polynomial equation $ax^7+bx^5+cx^3+dx+e=0$ has

B

(A) only one real root.
(B) at least one real root.
(C) an odd number of nonreal roots.
(D) no real roots.
(E) no positive real roots.

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37. Which is the best of the following polynomial approximations to $\cos 2x$ near $x=0$?

D

(A) $1+\frac{x}{2}$ (B) $1+x$ (C) $1-\frac{x^2}{2}$ (D) $1-2x^2$ (E) $1-2x+x^2$

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42. What are all values of k for which the graph of $y=x^3-3x^2+k$ will have three distinct x-intercepts?

D

(A) All $k>0$ (B) All $k<4$ (C) $k=0,4$ (D) $0<k<4$ (E) All k

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12. If $f(x)=2x^3+Ax^2+Bx-5$ and if $f(2)=3$ and $f(-2)=-37$, what is the value of $A+B$?

C

(A) -6 (B) -3 (C) -1 (D) 2

(E) It cannot be determined from the information given.

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31. If $\log_a\left(2^a\right)=\frac{a}{4}$, then $a=$

D

(A) 2 (B) 4 (C) 8 (D) 16 (E) 32

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43. If the solutions of $f(x)=0$ are -1 and 2, then the solutions of $f\left(\frac{x}{2}\right)=0$ are

(A) -1 and 2 (B) $-\frac{1}{2}$ and $\frac{5}{2}$ (C) $-\frac{3}{2}$ and $\frac{3}{2}$

(D) $-\frac{1}{2}$ and 1 (E) -2 and 4

E

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19. If $f(x_1)+f(x_2)=f(x_1+x_2)$ for all real numbers x_1 and x_2, which of the following could define f?

(A) $f(x)=x+1$ (B) $f(x)=2x$ (C) $f(x)=\frac{1}{x}$ (D) $f(x)=e^x$ (E) $f(x)=x^2$

B

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22. If $\ln x-\ln\left(\frac{1}{x}\right)=2$, then $x=$

(A) $\frac{1}{e^2}$ (B) $\frac{1}{e}$ (C) e (D) $2e$ (E) e^2

C

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37. If $f(x)=e^x\sin x$, then the number of zeros of f on the closed interval $[0,2\pi]$ is

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

D

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x	0	1	2
$f(x)$	1	k	2

26. The function f is continuous on the closed interval $[0,2]$ and has values that are given in the table above. The equation $f(x)=\frac{1}{2}$ must have at least two solutions in the interval $[0,2]$ if $k=$

(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) 2 (E) 3

A
