Name_____ Date_____ Period_____

AP Mixed Review (after 6.1)
Use a calculator only on those that say it's permitted. Put the CAPITAL letter in the blank for each problem.

_____ 1. (Calculator Permitted)

A particle moves along a straight line with velocity given by $v(t)=7-(1.01)^{-t^2}$ at time $t\geq 0$. What is the acceleration of the particle at time $t=3$?

(A) –0.914 (B) 0.055 (C) 5.486 (D) 6.086 (E) 18.087

_____ 2.

$\lim_{x\to\infty}\dfrac{(2x-1)(3-x)}{(x-1)(x+3)}$ is

(A) –3 (B) –2 (C) 2 (D) 3 (E) nonexistent

_____ 3.

$\int\dfrac{1}{x^2}dx=$

(A) $\ln x^2+C$ (B) $-\ln x^2+C$ (C) $x^{-1}+C$ (D) $-x^{-1}+C$ (E) $-2x^{-3}+C$

_____ 4.

If $f(x)=(x-1)(x^2+2)^3$, then $f'(x)=$

(A) $6x(x^2+2)^2$

(B) $6x(x-1)(x^2+2)^2$

(C) $(x^2+2)^2(x^2+3x-1)$

(D) $(x^2+2)^2(7x^2-6x+2)$

(E) $-3(x-1)(x^2+2)^2$

_____ 5.

$\lim_{x\to 0} \dfrac{5x^4+8x^2}{3x^4-16x^2}$ is

(A) $-\dfrac{1}{2}$ (B) 0 (C) 1 (D) $\dfrac{5}{3}+1$ (E) nonexistent

_____ 6.

$$f(x)=\begin{cases}\dfrac{x^2-4}{x-2} & \text{if } x\neq 2\\ 1 & \text{if } x=2\end{cases}$$

Let f be the function defined above. Which of the following statements about f are true?

I. f has a limit at $x=2$.

II. f is continuous at $x=2$.

III. f is differentiable at $x=2$.

(A) I only

(B) II only

(C) III only

(D) I and II only

(E) I, II, and III

_____ 7.

If $f(x)=\cos(3x)$, then $f'\left(\dfrac{\pi}{9}\right)=$

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

_____ 8.

If $f(x)=e^{(2/x)}$, then $f'(x)=$

(A) $2e^{(2/x)}\ln x$ (B) $e^{(2/x)}$ (C) $e^{(-2/x^2)}$ (D) $-\frac{2}{x^2}e^{(2/x)}$ (E) $-2x^2e^{(2/x)}$

_____ 9.

If $\sin(xy)=x$, then $\frac{dy}{dx}=$

(A) $\frac{1}{\cos(xy)}$

(B) $\frac{1}{x\cos(xy)}$

(C) $\frac{1-\cos(xy)}{\cos(xy)}$

(D) $\frac{1-y\cos(xy)}{x\cos(xy)}$

(E) $\frac{y(1-\cos(xy))}{x}$

_____ 10.

In the xy-plane, the line $x+y=k$, where k is a constant, is tangent to the graph of $y=x^2+3x+1$. What is the value of k?

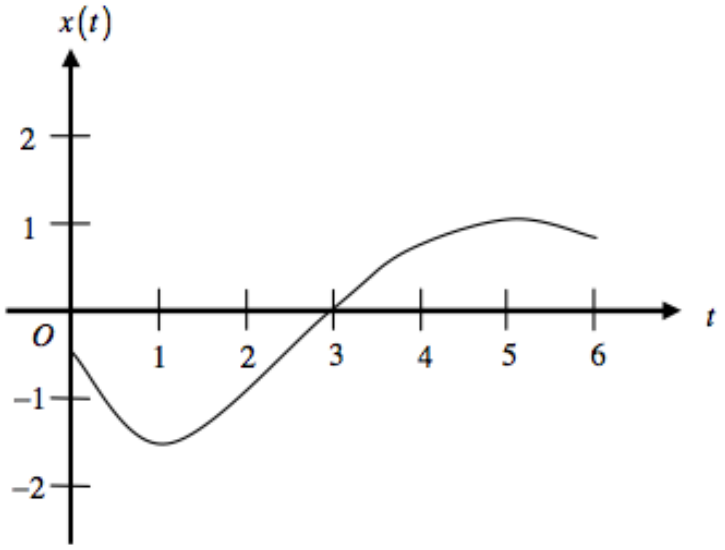
(A) -3 (B) -2 (C) -1 (D) 0 (E) 1

_____ 11.

What is the slope of the line tangent to the curve $y=\arctan(4x)$ at the point at which $x=\frac{1}{4}$?

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

____ 12.



A particle moves along a straight line. The graph of the particle's position $x(t)$ at time t is shown above for $0<t<6$. The graph has horizontal tangents at $t=1$ and $t=5$ and a point of inflection at $t=2$. For what values of t is the velocity of the particle increasing?

(A) $0<t<2$

(B) $1<t<5$

(C) $2<t<6$

(D) $3<t<5$ only

(E) $1<t<2$ and $5<t<6$

_____ 13.

$$f(x)=\begin{cases} cx+d & \text{for } x\le 2 \\ x^2-cx & \text{for } x>2 \end{cases}$$

Let f be the function defined above, where c and d are constants. If f is differentiable at $x=2$, what is the value of $c+d$?

(A) –4 (B) –2 (C) 0 (D) 2 (E) 4

_____ 14.

Let f be a differentiable function such that $f(3)=15$, $f(6)=3$, $f'(3)=-8$, and $f'(6)=-2$. The function g is differentiable and $g(x)=f^{-1}(x)$ for all x. What is the value of $g'(3)$?

(A) $-\frac{1}{2}$

(B) $-\frac{1}{8}$

(C) $\frac{1}{6}$

(D) $\frac{1}{3}$

(E) The value of $g'(3)$ cannot be determined from the information given.

_____ 15. (Calculator Permitted)

The first derivative of the function f is defined by $f'(x)=\sin\left(x^3-x\right)$ for $0\le x\le 2$. On what interval(s) is f increasing?

(A) $1\le x\le 1.445$

(B) $1\le x\le 1.691$

(C) $1.445\le x\le 1.875$

(D) $0.577\le x\le 1.445$ and $1.875\le x\le 2$

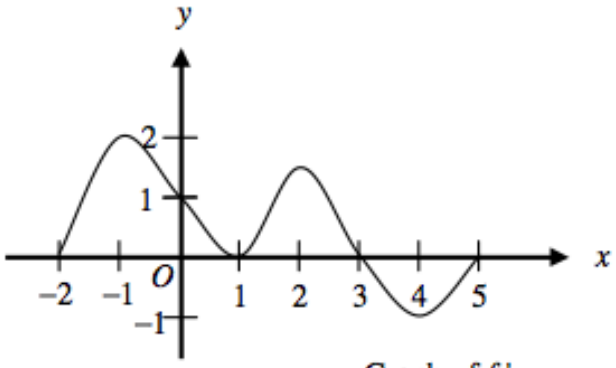
(E) $0\le x\le 1$ and $1.691\le x\le 2$

_____ 16. (Calculator Permitted)

The derivative of the function f is given by $f'(x)=x^2\cos\left(x^2\right)$. How many points of inflection does the graph of f have on the open interval $(-2, 2)$?

(A) One (B) Two (C) Three (D) Four (E) Five

_____ 17.



Graph of f'

The graph of f', the derivative f, is shown above for $-2 \le x \le 5$. On what intervals is f increasing?

(A) $[-2, 1]$ only

(B) $[-2, 3]$

(C) $[3, 5]$ only

(D) $[0, 1.5]$ and $[3, 5]$

(E) $[-2, -1]$, $[1, 2]$, and $[4, 5]$

_____ 18.

The radius of a sphere is decreasing at a rate of 2 centimeters per second. At the instant when the radius of the sphere is 3 centimeters, what is the rate of change, in square centimeters per second, of the surface area of the sphere? (The surface area S of a sphere with radius r is $S = 4\pi r^2$)

(A) -108π (B) -72π (C) -48π (D) -24π (E) -16π

_____ 19.

The function f is continuous for $-2 \le x \le 2$ and $f(-2) = f(2) = 0$. If there is no c, where $-2 < c < 2$, for which $f'(c) = 0$, which of the following statements must be true?

(A) For $-2 < k < 2$, $f'(k) > 0$.

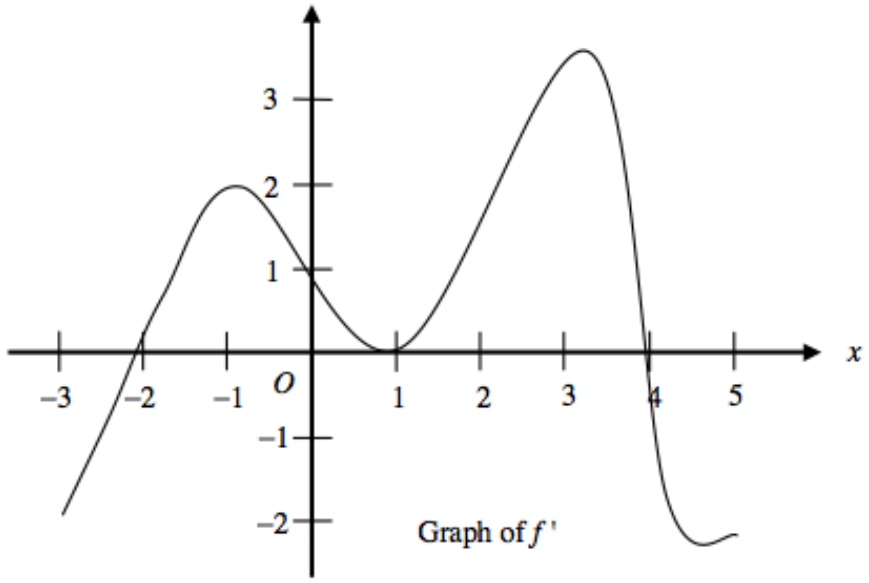
(B) For $-2 < k < 2$, $f'(k) < 0$.

(C) For $-2 < k < 2$, $f'(k)$ exists.

(D) For $-2 < k < 2$, $f'(k)$ exists, but f' is not continuous.

(E) For some k, where $-2 < k < 2$, $f'(k)$ does not exist.

_____ 20.



The graph of the derivative of a function f is shown in the figure above. The graph has horizontal tangent lines at $x = -1$, $x = 1$, and $x = 3$. At which of the following values of x does f have a relative maximum?

(A) −2 only

(B) 1 only

(C) 4 only

(D) −1 and 3 only

(E) −2, 1, and 4