Peterson p.529 AP Calculus AB

1. $\int_0^1 e^{2x}dx =$

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

2. If $f(x) = \tan(e^{\sin x})$, then $f'(x) =$

(A) $-e^{\sin x}\cos x \sec^2\left(e^{\sin x}\right)$

(B) $e^{\sin x}\cos x \sec^2\left(e^{\sin x}\right)$

(C) $-e^{\sin x}\sec\left(e^{\sin x}\right)\tan\left(e^{\sin x}\right)$

(D) $e^{\sin x}\sec^2\left(e^{\sin x}\right)$

(E) $e^{\sin x}\sec\left(e^{\sin x}\right)\tan\left(e^{\sin x}\right)$

3. If $F(x) = \int_2^{x^2} t^2 dt$, then $F(2) =$

(A) $\frac{64}{3}$ (B)64 (C) $\frac{16}{3}$ (D)16 (E) $\frac{56}{3}$

4. If $f(x) = \tan^2 x + \sin x$, then $f'\left(\frac{\pi}{4}\right) =$

(A) $\frac{4+\sqrt{2}}{2}$

(B) $\frac{2+\sqrt{2}}{2}$

(C) $\frac{8+\sqrt{2}}{2}$

(D) $\frac{8-\sqrt{2}}{2}$

(E) $\frac{4-\sqrt{2}}{2}$

5. At which of the following points is the graph of $f(x) = x^4 - 2x^3 - 2x^2 - 7$ decreasing and concave down?

(A) $(1, -10)$
(B) $(2, -15)$
(C) $(3, 2)$
(D) $(-1, -6)$
(E) $(-2, 17)$

6. Which of the following are antiderivatives of $f(x) = \cos^3 x \sin x$?

I. $F(x) = \dfrac{-\cos^4 x}{4}$

II. $F(x) = \dfrac{\sin^2 x}{2} - \dfrac{\sin^4 x}{4}$

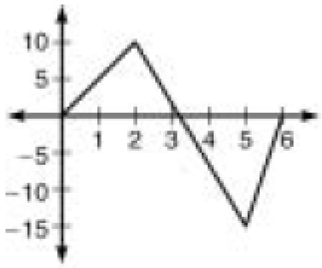
III. $F(x) = \dfrac{1 - \cos^4 x}{4}$

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

7. $\left(\dfrac{d}{dx}\right)\left(e^{\sin 2x}\right) =$

(A) $-\cos 2x e^{\sin 2x}$
(B) $\cos 2x e^{\sin 2x}$
(C) $2e^{\sin 2x}$
(D) $2\cos 2x e^{\sin 2x}$
(E) $-2\cos 2x e^{\sin 2x}$

QUESTIONS 8 AND 9 REFER TO THE GRAPH BELOW OF THE VELOCITY OF A MOVING OBJECT AS A FUNCTION OF TIME.



8. At what time has the object reached its maximum speed?

(A) 0
(B) 2
(C) 3
(D) 5
(E) 6

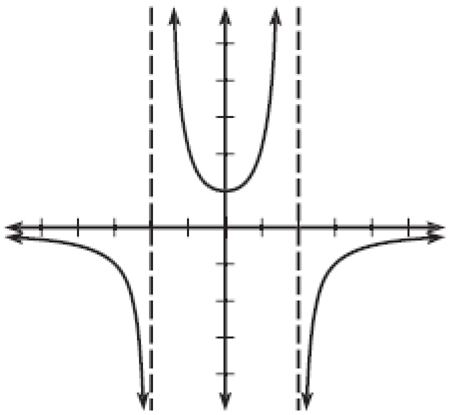
9. Over what interval does the object have the greatest acceleration?

(A) [0,2]
(B) [2,3]
(C) [2,4]
(D) [3,5]
(E) [5,6]

10. An equation of the line tangent to $y = \sin x + 2\cos x$ at $\left(\frac{\pi}{2}, 1\right)$ is

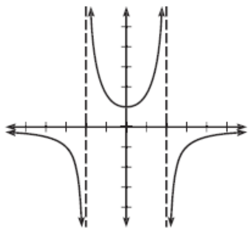
(A) $2x - y = \pi - 1$
(B) $2x + y = \pi + 1$
(C) $2x - 2y = 2 - \pi$
(D) $4x + 2y = 2 - \pi$
(E) None of the above

11. The graph of the function f is given below.

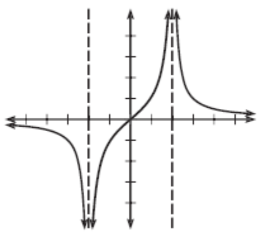


以下何者為 $y = f\,'(x)$ 的圖形

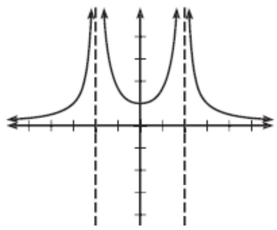
(A)



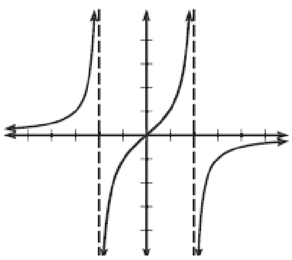
(B)



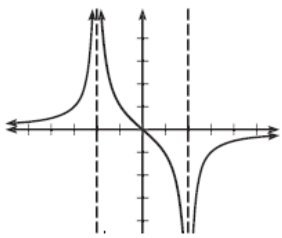
(C)



(D)



(E)



12. The function f is given by $f(x) = x^4 - 8x^3 + 24x^2 - 32x + 15$.

All of these statements are true EXCEPT

(A) 1 and 3 are zeros of f.

(B) $f'(2) = 0$.

(C) $f''(2) = 0$.

(D) $(2, -1)$ is a point of inflection of f.

(E) $(2, -1)$ is a local minimum of f.

13. The function f is given by $f(x) = 3e^{\sin x}$.

f is decreasing over which interval?

(A) $[0,\pi]$

(B) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$

(C) $\left[\frac{\pi}{2},\frac{3\pi}{2}\right]$

(D) $\left[\frac{3\pi}{2},\frac{5\pi}{2}\right]$

(E) $[-\infty,\infty]$

14. Let f and g be twice differentiable functions such that $f'(x) \geq 0$ for all x in the domain of f. If $h(x) = f(g'(x))$ and $h'(3) = -2$, then at $x = 3$

(A) h is concave down.

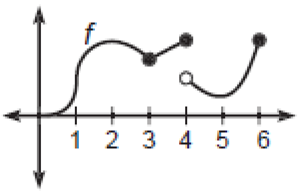
(B) g is decreasing.

(C) f is concave down.

(D) g is concave down.

(E) f is decreasing.

15. In the diagram below, f has a vertical tangent at $x = 1$ and horizontal tangents at $x = 2$ and at $x = 5$. All of these statements are true EXCEPT



(A) $\lim_{x\to 3^+} f(x) = \lim_{x\to 3^-} f(x)$

(B) $\lim_{x\to 5} f(x) = f(5)$

(C) $\lim_{h\to 0} \frac{f(2+h)-f(2)}{h} = 0$

(D) $\lim_{h\to 0^-} \frac{f(4+h)-f(4)}{h} = \lim_{h\to 0^+} \frac{f(4+h)-f(4)}{h}$

(E) $\lim_{x\to 2.5} f(x) > \lim_{h\to 0} \frac{f(2.5+h)-f(2.5)}{h}$

16. What is the area of the region bounded by the curves $y = x^3 + 1$ and $y = -x^2$ from $x = 0$ to $x = 2$?

(A) $-\frac{26}{3}$ (B) $-\frac{10}{3}$ (C) $\frac{10}{3}$ (D) $\frac{20}{3}$ (E) $\frac{26}{3}$

17. Determine $\frac{dy}{dx}$ for the curve defined by $x^3 + y^3 = 3xy$.

(A) $\frac{x^2}{y^2 - x}$

(B) $\frac{x^2}{x - y^2}$

(C) $\frac{y - x^2}{y^2 - x}$

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

(E) $\frac{x^2 - y}{y^2 - x}$

18. $\int_0^{\pi/4} \sin 2x \, dx =$

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

19. The graph of $f(x) = (x-4)^3(3x-1)^3$ has a local minimum at $x =$

(A)-4 (B) $-\frac{1}{3}$ (C) $\frac{1}{3}$ (D) $\frac{13}{6}$ (E)4

20. What is the average value of $y = \sin 2x$ over $\left[\frac{\pi}{4}, \frac{\pi}{3}\right]$?

(A) $-\frac{6}{\pi}$ (B) $-\frac{1}{6\pi}$ (C) $\frac{3}{\pi}$ (D) 3π (E) $\frac{6}{\pi}$

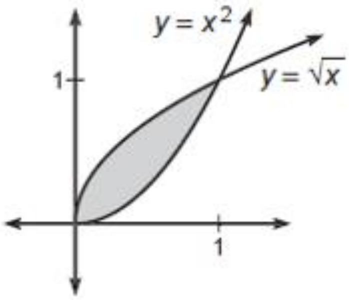
21. $\lim_{x\to\infty} \frac{5x^2+7x-3}{2+3x-11x^2} =$

(A) $-\frac{3}{2}$ (B) $-\frac{5}{11}$ (C) 0 (D) $\frac{7}{3}$ (E) it is nonexistent

22. The graph of $f(x) = \frac{1-x}{x^2-1}$ is concave down over which interval(s)?

(A) $(-\infty,-1)$ (B) $(-1,\infty)$ (C) $(-1,1)\cup(1,\infty)$ (D) $(-\infty,1)$ (E) $(-\infty,\infty)$

23.



The area of the shaded region in the diagram above is equivalent to

(A) $\int_0^1 \left(x^2-\sqrt{x}\right)dx$ (B) $\pi\int_0^1 \left(x^4-x\right)dx$ (C) $\int_0^1 \left(\sqrt{x}-x^2\right)dx$

(D) $2\pi\int_0^1 \left(x\left(\sqrt{x}-x^2\right)\right)dx$ (E) $\pi\int_0^1 \left(\sqrt{x}-x^2\right)^2 dx$

24. $\lim_{h\to 0}\frac{\tan 2\left(\frac{\pi}{8}+h\right)-\tan\frac{\pi}{4}}{h}=$

(A) $\frac{3}{2}$ (B)2 (C) $2\sqrt{2}$ (D)4 (E) $4\sqrt{2}$

25. $\int_1^{e^2}\left(\frac{\ln^2 x}{x}\right)dx=$

(A) $\frac{7}{3e^2}$ (B) $\frac{4}{e^2}$ (C)2 (D) $\frac{7}{3}$ (E) $\frac{8}{3}$

26. A particle's position is given by $s(t) = \sin t + 2\cos t + \frac{t}{\pi} + 2$.

The average velocity of the particle over $[0,2\pi]$ is

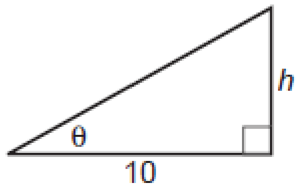
(A) $-\frac{\pi+1}{\pi}$ (B) $-\frac{1}{3}$ (C)0 (D) $\frac{1}{\pi}$ (E) $\frac{\pi+1}{\pi}$

27. If $f(x) = \begin{cases} e^x, & x < \ln 2 \\ 2, & x \ge \ln 2 \end{cases}$ then

$\lim_{x\to\ln 2} f(x)=$

(A) $\frac{1}{2}$ (B)ln2 (C)2 (D) e^2 (E)It is nonexistent

28.



In the triangle shown above, θ is increasing at a constant rate of $\frac{15}{26}$ radians per minute.

At what rate is the area of the triangle increasing, in square units per minute, when h is 24 units?

(A) $\frac{338}{5}$ (B)39 (C) $\frac{195}{4}$ (D)182 (E)195

1. D	7. D	13. C	19. D	24. D
2. B	8. D	14. D	20. C	25. E
3. E	9. E	15. D	21. B	26. D
4. C	10. B	16. E	22. C	27. C
5. A	11. B	17. C	23. C	28. E
6. E	12. D	18. D		

29. If $f(x)=\frac{e^{3x}}{\sin x^2}$ then $f'(x)$ =

(A) $e^{3x}\frac{3\sin x^2-2x\cos x^2}{\sin^2 x^2}$

(B) $\frac{3e^{3x}}{2x\cos x^2}$

(C) $e^{3x}\frac{2x\cos x^2-3\sin x^2}{\sin^2 x^2}$

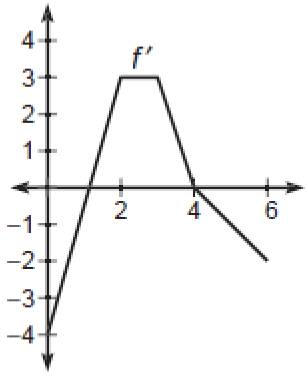
(D) $e^{3x}\frac{3\sin x^2+2x\cos x^2}{\sin^2 x^2}$

(E) $-\frac{3e^{3x}}{2x\cos x^2}$

30. Which of the following is an equation for a line tangent to the graph of $f(x) = e^{2x}$ when $f'(x) = 10$?

(A) y=10x-8.05 (B)y=x-8.05 (C)y=x-3.05 (D)y=10x-11.5 (E)y=10x-3.05

31.



The graph of the derivative of f is shown above.

Which of the following statements is true?

比較 f(0) 、f(2)、 f(4) 、f(6)的大小

32. Let f be a function such that

$$\lim_{h \to 0} \frac{f(5+h)-f(5)}{h} = 3.$$

Which of the following must be true?

I. $f(5) = 3$

II. $f'(5) = 3$

III. f is continuous and differentiable at $x = 5$.

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

33. The function f whose derivative is given by $f'(x) = 5x^3 - 15x + 7$ has a local maximum at $x =$

(A)-1.930 (B)-1.000 (C)0.511 (D)1.000 (E)1.419

34. Car A is traveling south at 40 mph toward Millville, and Car B is traveling west at 30 mph toward Millville.

If both cars began traveling 100 miles outside of Millville at the same time, then at what rate, in mph, is the distance between them decreasing after 90 minutes?

(A)35.00 (B)47.79 (C)50.00 (D)55.14 (E)68.01

35. Let $f(x)=\frac{|x^2-1|}{x-1}$. Which of these statements is true?

I. f is continuous at $x=-1$.
II. f is differentiable at $x=1$.
III. f has a local maximum at $x=-1$.

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

36. If $y=3x-7$ and $x \ge 0$, what is the minimum product of x^2y?

(A)-5.646 (B)0 (C)1.555 (D)2.813 (E)3.841

37. What is the area of the region bounded by $y=\sin x$, $y=\frac{1}{4}x-1$, and the y-axis?

(A)0.772 (B)2.815 (C)3.926 (D)5.552 (E)34.882

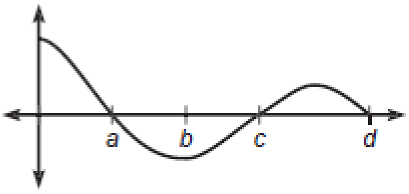
38. A region R located in the first quadrant is bounded by the x-axis, $y=\sin x$, and $y=\left(\frac{1}{2}\right)x$. Determine the volume of the solid formed when R is rotated about the y-axis.

(A)1.130 (B)2.724 (C)3.265 (D)16.875 (E)17.117

39. Let f be the function given by $f(x)=\frac{3x^3}{e^x}$. For what value of x is the slope of the line tangent to f equal to -1.024?

(A)-9.004 (B)-4.732 (C)1.209 (D)1.277 (E)4.797

40.



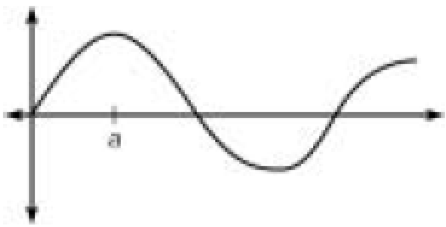
The graph of f is shown above. If $g(x)=\int_a^x f(t)\,dt$, for what value of x does $g(x)$ have a relative minimum?

(A)a (B)b (C)c (D)d (E)無法決定

41. The graph of the function $y = x^5 - x^2 + \sin x$ changes concavity at $x =$

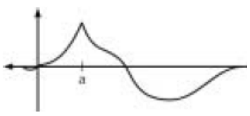
(A)0.324 (B)0.499 (C)0.506 (D)0.611 (E)0.704

42.

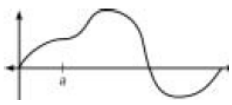


Let $f(x)=\int_0^x h(t)\,dt$, where h is the graph shown above. Which of the following could be the graph of f?

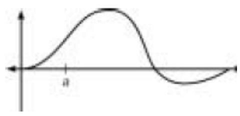
(A)



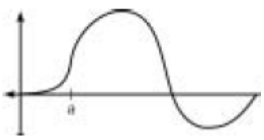
(B)



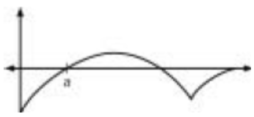
(C)



(D)



(E)



43.

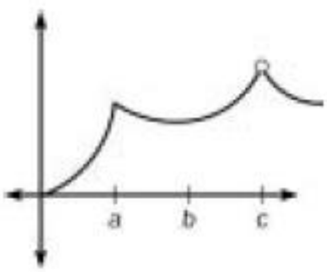
x	0	1	2	3	4	5	6
$f(x)$	1	2	4	1	3	2	5

A table of values for a continuous function f is shown above.

If three equal subintervals are used for [0,6], which of the following is equivalent to a right-hand Riemann Sum approximation for $\int_0^6 f(x)\,dx$?

(A)14 (B)17 (C)20 (D)24 (E)27

44.



The graph of a function f is shown above. Which of these statements about f is false?

(A)f is continuous but not differentiable at x=a

(B) $\lim_{x\to a^-}\left(\frac{f(x+a)-f(x)}{a}\right) \neq \lim_{x\to a^+}\left(\frac{f(x+a)-f(x)}{a}\right)$

(C)f(a) is defined,but f(c) is not (D) $f'(b)=0$

(E) $\lim_{x\to c^-}(f(x)) \neq \lim_{x\to c^+}(f(x))$.

45. Let f be defined as follows:

$$f(x)=\begin{cases}-x^2, & x\le 0\\ \sqrt{x}, & x>0\end{cases}$$

Let $g(x) = \int_{-2}^{x} f(t)\,dt$. For what value of $x \neq -2$ would $g(x) = 0$?

(A)0 (B) $\sqrt{2}$ (C)2 (D) $2\sqrt[3]{2}$ (E) $2\sqrt{2}$

29. A	33. C	37. C	40. C	43. D
30. E	34. B	38. E	41. B	44. E
31. D	35. D	39. E	42. C	45. D
32. E	36. A			