AP Calculus Practice Exam
AB Version - Section I - Part A

Calculators ARE NOT Permitted On This Portion Of The Exam
28 Questions - 55 Minutes

1) Give $f(g(-2))$, given that

$$\left[f(x) = x - 2,\ g(x) = \frac{x}{x^2 + 1} \right]$$

a) $\frac{-11}{5}$

b) $\frac{-4}{17}$

c) -3

d) $\frac{14}{85}$

e) $\frac{-12}{5}$

2) Find the slope of the tangent line to the graph of f at $x = 4$, given that

$$f(x) = x^2 - 6\sqrt{x}$$

a) $\frac{11}{2}$

b) $\frac{17}{2}$

c) $\frac{19}{2}$

d) $\frac{13}{2}$

e) $\frac{9}{2}$

3) Determine

$$\lim_{x \to \infty} \left(\frac{3x^3 + x}{4x^5 + 3x^2 - 2} \right)$$

a) 1

b) $\frac{3}{4}$

c) $\frac{9}{20}$

d) 0

e) ∞

4) Let

$$f(x) = x^3$$

A region is bounded between the graphs of $y = -1$ and $y = f(x)$ for x between -1 and 0, and between the graphs of $y = 1$ and $y = f(x)$ for x between 0 and 1. Give an integral that corresponds to the area of this region.

a) $\int_{-1}^{1} \left(1 + x^3\right) \, dx$

b) $\int_{-1}^{1} \left(1 - x^3\right) \, dx$

c) $\int_{0}^{1} 2\left(1 + x^3\right) \, dx$

d) $\int_{0}^{1} \left(-x^3 - 1\right) \, dx$

e) $\int_{0}^{1} 2\left(1 - x^3\right) \, dx$

5) Given that

$$5x^3 - 3xy - 2y^2 = 1$$

Determine the change in y with respect to x.

a) $-\dfrac{15\,x^2-3}{-3\,x-4\,y}$

b) $-\dfrac{15\,x^2-3\,y}{-3-4\,y}$

c) $-\dfrac{15\,x^2-3\,y}{-3\,x-4\,y}$

d) $-\dfrac{15\,x^2-3}{-3-4\,y}$

e) $-\dfrac{10\,x-3\,y}{-3\,x-2}$

6) Compute the derivative of

$$-3\sec(x)+5\csc(x)$$

a) $-3\,(\tan(x))^2-5\,(\cot(x))^2$

b) $-3\,(\sec(x))^2-5\,(\csc(x))^2$

c) $-3\sec(x)\tan(x)+5\csc(x)\cot(x)$

d) $-3\sec(x)\tan(x)-5\csc(x)\cot(x)$

e) $-3\csc(x)-5\sec(x)$

7) Compute

$$\int_0^{\frac{1}{4}} \frac{16}{1+16\,t^2}\,dt$$

a) $4\,\pi$

b) $3\,\pi$

c) 0

d) $-\pi$

e) π

8) Determine

$$\frac{d}{dx}\left(\frac{2x^4 - 4x}{2x^4 + 4x}\right)$$

a) $\dfrac{48x^2 - 1}{(2x^3 + 4)^2}$

b) $\dfrac{12x^2}{(x^3 + 2)^2}$

c) $\dfrac{24x^2 - 1}{(2x^3 + 4)^2}$

d) $\dfrac{24x^2}{(2x^3 + 4)^2}$

e) $\dfrac{12x^2}{(2x^3 + 4)^2}$

9) Give the equation of the normal line to the graph of

$$y = 4x\sqrt{x^2 + 4} - 2$$

at the point (0 , -2).

a) $8x + y = -2$

b) $x - 8y = 16$

c) $x + 8y = -16$

d) $-8x + y = -2$

e) $x + 8y = -2$

10) Determine the concavity of the graph of

$$f(x) = 4\sin(x) + 4\,(\cos(x))^2$$

at $x = \pi$.

a) -8

b) -6

c) -11

d) 4

e) 8

11) Compute

$$\int 4x^2\sqrt{x^3+3}\ dx$$

a) $\frac{16}{9}\left(x^3+3\right)^{(3/2)}+C$

b) $\frac{8}{9}\left(x^3+3\right)^{(3/2)}+C$

c) $\frac{8}{3}\left(x^3+3\right)^{(3/2)}+C$

d) $\frac{4}{3}\frac{1}{\sqrt{x^3+3}}+C$

e) $\frac{8}{3}\frac{1}{\sqrt{x^3+3}}+C$

12) Give the value of *x* where the function

$$f(x)=x^3+\frac{15}{2}x^2+12x-2$$

has a local minimum.

a) 1

b) -1

c) -4

d) 4

e) -3

13) The slope of the tangent line to the graph of

$$-3x^2+cx-3e^y=-3$$

at $x = 0$ is 4. Give the value of *c*.

a) -6

b) 6

c) -3

d) -12

e) 12

14) Compute

$$\int \left(2^x - 4\,e^{(2\ln(x))}\right)\,dx$$

a) $2^x \ln(2) - \dfrac{2\,e^{(2\ln(x))}}{x} + C$

b) $2^x \ln(2) - 2\,e^{(2\ln(x))} + C$

c) $\dfrac{2^x}{\ln(2)} - \dfrac{4}{3}x^3 + C$

d) $\dfrac{2^x}{\ln(2)} - 2\,e^{(2\ln(x))} + C$

e) $\dfrac{2^x}{\ln(2)} - 2x^2 + C$

15) What is the average value of the function

$$g(x) = (2x + 4)^2$$

on the interval from x = -4 to x = -1?

a) -4

b) 4

c) 10

d) 12

e) 6

16) Compute

$$\lim_{t \to 0} \left(\frac{\tan\left(\frac{1}{4}\pi + t\right) - \tan\left(\frac{1}{4}\pi\right)}{t} \right)$$

a) -1

b) 2

c) $\frac{1}{4}\pi$

d) π

e) 1

17) Find the instantaneous rate of change of

$$f(t) = \left(3t^3 - 4t + 4\right)\sqrt{t^2 + 3t + 4}$$

at $t = 0$.

a) $\frac{-3}{2}$

b) -8

c) -6

d) -5

e) -1

18) Compute

$$\frac{d}{dx}\,7^{\cos(x)}$$

a) $-\sin(x)\,7^{\cos(x)}\ln(7)$

b) $\sin(x)\,7^{\cos(x)}\ln(7)$

c) $-\sin(x)\,7^{\cos(x)}$

d) $-\frac{\sin(x)\,7^{\cos(x)}}{\ln(7)}$

e) $\frac{\sin(x)\,7^{\cos(x)}}{\ln(7)}$

19) A solid is generated by rotating the region enclosed by the graph of

$$y = \sqrt{x}$$

the lines $x = 1$, $x = 2$, and $y = 1$, about the x-axis. Which of the following integrals gives the volume of the solid?

a) $\int_1^2 \pi\ (x-1)^2\ dx$

b) $\int_1^2 \pi\ (x-1)\ dx$

c) $\int_1^2 \pi\ \left(\sqrt{x}-1\right)^2\ dx$

d) $\int_1^2 \pi\ (2-x)^2\ dx$

e) $\int_1^2 \pi\ \left(2-\sqrt{x}\right)^2\ dx$

20) Compute

$$\lim_{x \to 0} \left(\frac{2x}{\sin(3x)} + \frac{x}{\cos(3x)} \right)$$

a) $\frac{2}{3}$

b) *undefined*

c) 0

d) $\frac{1}{3}$

e) ∞

21) Given $y > 0$ and

$$\frac{dy}{dx} = \frac{3x^2 + 4x}{y}$$

If the point

$$\left(1, \sqrt{10}\right)$$

is on the graph relating x and y, then what is y when $x = 0$?

a) 6

b) 3

c) 1

d) 10

e) 2

22) Determine

$$\int_1^2 \frac{1}{\sqrt{4-t^2}}\,dt$$

a) π

b) $\frac{1}{2}\pi$

c) $\frac{1}{3}\pi$

d) $\frac{1}{6}\pi$

e) $\frac{1}{4}\pi$

23) Determine

$$\int e^{(2x)}\sqrt{e^x+1}\,dx$$

a) $\frac{2}{5}\left(e^x+1\right)^{(5/2)}-3\left(e^x+1\right)^{(3/2)}+C$

b) $e^{(2x)}\left(e^x+1\right)^{(3/2)}+C$

c) $\frac{2}{5}e^{\left(\frac{5}{2}x\right)}-5\,e^{\left(\frac{3}{2}x\right)}+C$

d) $\frac{2}{5}\left(e^x+1\right)^{(5/2)}+3\left(e^x+1\right)^{(3/2)}+C$

e) $\frac{2}{5}\left(e^x+1\right)^{(5/2)}-\frac{2}{3}\left(e^x+1\right)^{(3/2)}+C$

24) A particle's acceleration for $t \geq 0$ is given by

$$a(t) = 12t + 4$$

The particle's initial position is 2 and its velocity at $t = 1$ is 5. What is the position of the particle at $t = 2$?

a) 20

b) 10

c) 4

d) 16

e) 12

25) Determine

$$\int_0^{\frac{1}{2}\pi} \sin(3x)\ dx + \int_0^{\frac{1}{6}\pi} \cos(3x)\ dx$$

a) 0

b) $\frac{-2}{3}$

c) 1

d) -1

e) $\frac{2}{3}$

26) Determine the derivative of

$$f(x) = (\cos(3x + 2))^3$$

at $x = \pi/3$.

a) $-9\cos(\pi + 2)^2 \sin(\pi + 2)$

b) $-9\ (\cos(\pi + 2))^2$

c) $-9\ (\cos(\pi + 2))^2 \sin(\pi + 2)$

d) $27\ (\cos(\pi + 2))^2 \sin(\pi + 2)$

e) $27\ (\cos(\pi + 2))^2$

27) Compute the derivative of

$$f(x) = \int_0^{x^2} \ln\left(t^2 + 1\right)\ dt$$

a) $\ln\left(x^2 + 1\right)$

b) $\dfrac{2x}{x^4 + 1}$

c) $2x \ln\left(x^2 + 1\right)$

d) $2x \ln\left(x^4 + 1\right)$

e) $\ln\left(x^4 + 1\right)$

28) Determine

$$\frac{d}{dx} \ln(\ln(2 - \cos(x)))$$

a) $\dfrac{\sin(x)\ (2 - \cos(x))}{\ln(2 - \cos(x))}$

b) $\dfrac{\sin(x)}{\ln(2 - \cos(x))}$

c) $\dfrac{\cos(x)}{(2 - \cos(x))\ \ln(2 - \cos(x))}$

d) $-\dfrac{\cos(x)}{\ln(2 - \cos(x))}$

e) $\dfrac{\sin(x)}{(2 - \cos(x))\ \ln(2 - \cos(x))}$

AP Calculus Practice Exam
AB Version - Section I - Part B

Calculators ARE Permitted On This Portion Of The Exam
17 Questions - 50 Minutes

1) Give a value of *c* that satisfies the conclusion of the Mean Value Theorem for Derivatives for the function

$$f(x) = x^2 + x + 2$$

on the interval [1,3].

a) $\frac{1}{2}$

b) $\frac{5}{4}$

c) $\frac{3}{2}$

d) $\frac{9}{4}$

e) 2

2) The function

$$f(x) = x^3 + 3\,e^{(3x)}$$

is invertible. Give the derivative of f^{-1} at $x = 3$.

a) 1

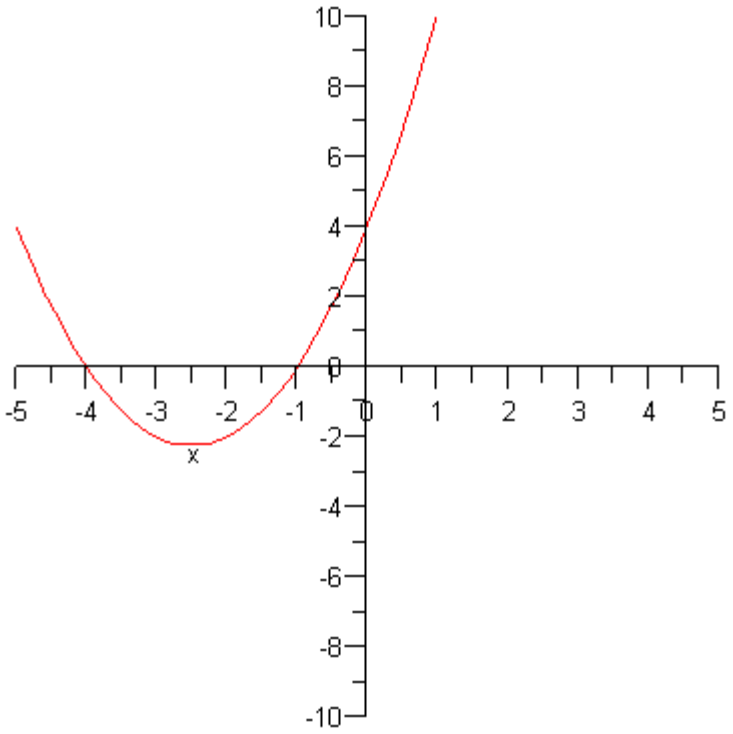
b) $\frac{1}{3 + 9\,e^3}$

c) $3 + 9\,e^3$

d) $\frac{1}{9}$

e) 9

3) The **derivative** of *f* is graphed below.



Give a value of x where f has a local minimum.

a) 1

b) $\frac{-5}{2}$

c) *There is no such value of x.*

d) -1

e) -4

4) Let

$$f(x) = \begin{cases} -x + 5 & x < -2 \\ x^2 + 1 & -2 \leq x \text{ and } x \leq 1 \\ 2x^3 - 1 & 1 \leq x \end{cases}$$

Which of the following is (are) true?

1) f is continuous at x = -2.
2) f is differentiable at x = 1.
3) f has a local minimum at x = 0.
4) f has an absolute maximum at x = -2.

a) 1 and 3
b) 2 and 4
c) 2 only
d) 1 and 4
e) 3 only
5) Given

$$\left[\int_0^{50} 4\, f(x)\, dx = 2,\ \int_2^{50} f(x)\, dx = -4\right]$$

Determine

$$\int_0^2 f(x)\, dx$$

a) *There is not enough information.*

b) $\frac{-7}{2}$

c) $\frac{9}{2}$

d) 9

e) -7

6) Give the approximate location of a local maximum for the function

$$f(x) = 2x^3 + 2x^2 - 4x$$

a) $(-1.215, -1.262)$

b) $(-1.215, 4.174)$

c) $(0.5486, -1.211)$

d) $(-1.215, 4.224)$

e) $(0.5486, -1.262)$

7) Give the approximate average value of the function

$$f(x) = 3x \ln(2x)$$

over the interval [1,4].

a) 13.51637002

b) 9.398

c) 15.54

d) 9.54

e) 12.54

8) The region enclosed by the graphs of

$$[y = x^3 - 1,\ y = x - 1]$$

is rotated around the *y*-axis to generate a solid. What is the volume of the solid?

a) 0.7855

b) 1.676

c) 0.8380

d) 1.047

e) 2.356

9) What is the approximate instantaneous rate of change of the function

$$f(t) = \int_0^{4t} \cos(x)\ dx$$

at $t = \pi/3$?

a) 3.464

b) −.5000

c) −2.

d) 0.8660

e) −.6667

10) What is the error when the integral

$$\int_0^1 \sin(\pi x)\ dx$$

is approximated by the Trapezoidal rule with $n = 3$?

a) 0.059

b) 0.051

c) 0.032

d) 0.109

e) 0.011

11) The amount of money in a bank account is increasing at the rate of

$$R(t) = 10000\ e^{(0.06\,t)}$$

dollars per year, where t is measured in years. If $t = 0$ corresponds to the year 2005, then what is the approximate total amount of increase from 2005 to 2007.

a) $4,500
b) $21,250
c) $18,350
d) $32,560
e) $16,250

12) A particle moves with acceleration

$$a(t) = 4\,t^2 - 3\,t$$

and its initial velocity is 0. For how many values of t does the particle change direction?

a) 2

b) 1

c) 3

d) 0

e) 4

13) At what approximate rate (in cubic meters per minute) is the volume of a sphere changing at the instant when the surface area is 4 square meters and the radius is increasing at the rate of 1/6 meters per minute?

a) 0.5405

b) 0.6834

c) 2.112

d) 1.190

e) 0.6667

14) A rectangle has one side on the *x*-axis and the upper two vertices on the graph of

$$y = e^{(-7x^2)}$$

Give a decimal approximation to the maximum possible area for this rectangle.

a) $-.5346$

b) 0.5346

c) 0.3242

d) 0.8817

e) 0.2918

15) A rough approximation for ln(5) is 1.609. Use this approximation and differentials to approximate ln(519/100).

a) 1.628

b) 1.647

c) 1.646

d) 1.571

e) 1.590

16) The function

$$f(x) = \begin{cases} n x^3 - x & x \leq 1 \\ m x^2 + 5 & 1 < x \end{cases}$$

is differentiable everywhere. What is *n*?

a) -14

b) -11

c) 13

d) -17

e) -9

17) Which of the following functions has a vertical asymptote at $x = -1$ and a horizontal asymptote at $y = 2$?

a) $f(x) = \dfrac{x-1}{2x+2}$

b) $f(x) = e^{(x-1)} + 2$

c) $f(x) = \arctan(x - 1) + 2 - \frac{1}{2}\pi$

d) $f(x) = \frac{2x^2 + 1}{x^2 - 1}$

e) $f(x) = \ln(2x + 2)$

1) e)
2) d)
3) d)
4) e)
5) c)
6) d)
7) e)
8) b)
9) c)
10) a)
11) b)
12) b)
13) e)
14) c)
15) b)
16) b)
17) d)
18) a)
19) b)
20) a)
21) e)
22) c)
23) e)
24) d)
25) e)
26) a)
27) d)
28) e)

1) e)
2) d)
3) d)
4) e)
5) c)
6) d)
7) e)
8) b)
9) c)
10) a)
11) b)
12) b)
13) e)
14) c)
15) b)
16) b)
17) d)