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 $f(g(1))$, given that

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

a) 0

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

c) 2

d) 3

e) $\frac{-1}{2}$

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

$$f(x) = -x^2 - 4\sqrt{x}$$

a) -8

b) -7

c) -9

d) -10

e) -6

3) Determine

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

a) 0

b) ∞

c) -1

d) $\frac{-3}{5}$

e) 1

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) $\int_0^1 2\left(1 + x^3\right)\,dx$

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

c) $\int_0^1 2\left(1 - x^3\right)\,dx$

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

e) $\int_0^1 \left(-x^3 - 1\right)\,dx$

5) Given that

$$3x^3 - 4xy - 4y^2 = 1$$

Determine the change in y with respect to x.

a) $-\frac{6x - 4y}{-4x - 4}$

b) $-\frac{9x^2 - 4}{-4x - 8y}$

c) $-\frac{9x^2 - 4}{-4 - 8y}$

d) $-\dfrac{9x^2 - 4y}{-4x - 8y}$

e) $-\dfrac{9x^2 - 4y}{-4 - 8y}$

6) Compute the derivative of

$$4\sec(x) - 3\csc(x)$$

a) $4\csc(x) + 3\sec(x)$

b) $4\sec(x)\tan(x) + 3\csc(x)\cot(x)$

c) $4\,(\sec(x))^2 + 3\,(\csc(x))^2$

d) $4\sec(x)\tan(x) - 3\csc(x)\cot(x)$

e) $4\,(\tan(x))^2 + 3\,(\cot(x))^2$

7) Compute

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

a) 3π

b) 2π

c) 0

d) π

e) $-\pi$

8) Determine

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

a) $\dfrac{6x^2}{(2x^3+2)^2}$

b) $\dfrac{12x^2-1}{(2x^3+2)^2}$

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

d) $\dfrac{6x^2}{(1+x^3)^2}$

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

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

$$y = 3x\sqrt{x^2+6} - 3$$

at the point (0 , -3).

a) $x - 3\sqrt{6}\,y = 9\sqrt{6}$

b) $x + 3\sqrt{6}\,y = -9\sqrt{6}$

c) $3\sqrt{6}\,x + y = -3$

d) $-3\sqrt{6}\,x + y = -3$

e) $x + 3\sqrt{6}\,y = -3$

10) Determine the concavity of the graph of

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

at $x = \pi$.

a) 6

b) -7

c) 3

d) -6

e) -4

11) Compute

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

a) $-\dfrac{1}{\sqrt{x^3+3}}+C$

b) $-\dfrac{4}{3}\left(x^3+3\right)^{(3/2)}+C$

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

d) $-\dfrac{2}{\sqrt{x^3+3}}+C$

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

12) Give the value of x where the function

$$f(x)=x^3+6x^2+9x+4$$

has a local maximum.

a) 1

b) 3

c) -1

d) -2

e) -3

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

$$4x^2+cx+2e^y=2$$

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

a) 4

b) -4

c) 2

d) 8

e) -8

14) Compute

$$\int \left(7^x - 4\,e^{(7\ln(x))}\right)\,dx$$

a) $\frac{7^x}{\ln(7)} - \frac{1}{2}x^8 + C$

b) $7^x \ln(7) - \frac{4}{7}e^{(7\ln(x))} + C$

c) $7^x \ln(7) - \frac{4}{7}\frac{e^{(7\ln(x))}}{x} + C$

d) $\frac{7^x}{\ln(7)} - \frac{4}{7}e^{(7\ln(x))} + C$

e) $\frac{7^x}{\ln(7)} - \frac{4}{7}x^7 + C$

15) What is the average value of the function

$$g(x) = (2x+3)^2$$

on the interval from x = -3 to x = -1?

a) 5

b) -4

c) $\frac{7}{3}$

d) $\frac{14}{3}$

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

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) π

b) -1

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

d) 1

e) 2

17) Find the instantaneous rate of change of

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

at $t = 0$.

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

b) -2

c) -3

d) 0

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

18) Compute

$$\frac{d}{dx} 11^{\cos(x)}$$

a) $\frac{\sin(x)\ 11^{\cos(x)}}{\ln(11)}$

b) $-\sin(x)\ 11^{\cos(x)}$

c) $-\frac{\sin(x)\ 11^{\cos(x)}}{\ln(11)}$

d) $-\sin(x)\ 11^{\cos(x)}\ \ln(11)$

e) $\sin(x)\ 11^{\cos(x)}\ \ln(11)$

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

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

c) $\int_1^2 \pi \, (2 - x)^2 \, dx$

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

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

20) Compute

$$\lim_{x \to 0} \left(\frac{4x}{\sin(3x)} + \frac{x}{\cos(3x)} \right)$$

a) *undefined*

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

c) 0

d) 1

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) 2

b) 3

c) 1

d) 6

e) 10

22) Determine

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

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

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

c) π

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) 4

b) 12

c) 10

d) 20

e) 16

25) Determine

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

a) 1

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

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

d) 0

e) -1

26) Determine the derivative of

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

at $x = \pi/2$.

a) $18\ (\cos(\pi - 2))^2 \sin(\pi - 2)$

b) $-6\ (\cos(\pi - 2))^2$

c) $-6\ (\cos(\pi - 2))^2 \sin(\pi - 2)$

d) $18\ (\cos(\pi - 2))^2$

e) $-6 \cos(\pi - 2)^2 \sin(\pi - 2)$

27) Compute the derivative of

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

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

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

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

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

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

28) Determine

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

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

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

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

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

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

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

$$f(x) = x^2 - x - 1$$

on the interval [1,3].

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

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

c) 2

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

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

2) The function

$$f(x) = 4x^3 + 2e^{(2x)}$$

is invertible. Give the derivative of f^{-1} at $x = 2$.

a) $\frac{1}{12 + 4e^2}$

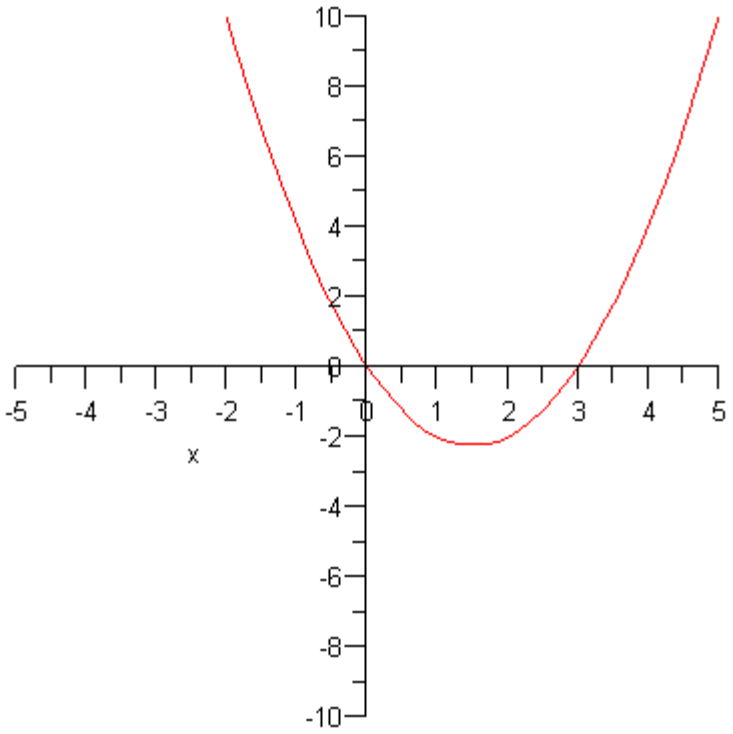
b) 4

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

d) $12 + 4e^2$

e) 1

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



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

a) 3

b) 0

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

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

e) 1

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

$$\left[\int_0^{50} 4\, f(x)\, dx = 3,\ \int_2^{50} f(x)\, dx = -2\right]$$

Determine

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

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

b) *There is not enough information.*

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

d) $\frac{11}{4}$

e) $\frac{-5}{4}$

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

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

a) $(0.2287, -.2527)$

b) $(-.7287, 1.502)$

c) $(-.7287, 1.449)$

d) $(0.2287, -.1992)$

e) $(-.7287, -.2527)$

7) Give the approximate average value of the function

$$f(x) = 4x \ln(3x)$$

over the interval [1,4].

a) 22.77

b) 17.77

c) 22.07647778

d) 20.77

e) 15.58

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) 2.356

b) 0.8380

c) 1.047

d) 1.676

e) 0.7855

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

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

at $t = \pi/11$?

a) 0.4158

b) 1.663

c) -3.638

d) $-.9095$

e) 0.1512

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) 0.011

b) 0.032

c) 0.109

d) 0.059

e) 0.051

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

12) A particle moves with acceleration

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

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

a) 0

b) 2

c) 3

d) 4

e) 1

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 3 square meters and the radius is increasing at the rate of 1/4 meters per minute?
a) 0.8105

b) 0.7750

c) 2.381

d) 1.536

e) 0.7500

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

$$y = e^{(-9x^2)}$$

Give a decimal approximation to the maximum possible area for this rectangle.
a) 0.2858

b) 0.4713

c) $-.4713$

d) 0.7773

e) 0.2573

15) A rough approximation for ln(5) is 1.609. Use this approximation and differentials to approximate ln(521/100).
a) 1.649

b) 1.630

c) 1.651

d) 1.567

e) 1.588

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) -17

b) -14

c) 13

d) -9

e) -11

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

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

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

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

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

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

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