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

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

a) $\frac{-53}{130}$

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

c) $\frac{1}{5}$

d) $\frac{-1}{5}$

e) $\frac{5}{26}$

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

$$f(x) = -x^2 + 8\sqrt{x}$$

a) -3

b) -7

c) -4

d) -6

e) -9

3) Determine

$$\lim_{x \to \infty} \left(\frac{4x^3 + 2x}{2x^5 + 4x^2 - 1} \right)$$

a) 2

b) ∞

c) 0

d) $\frac{6}{5}$

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

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

Determine the change in y with respect to x.

a) $-\frac{10x - 5y}{-5x + 2}$

b) $-\frac{15x^2 - 5}{-5x + 4y}$

c) $-\dfrac{15\,x^2-5}{-5+4\,y}$

d) $-\dfrac{15\,x^2-5\,y}{-5\,x+4\,y}$

e) $-\dfrac{15\,x^2-5\,y}{-5+4\,y}$

6) Compute the derivative of

$$5\,\sec(x)\,-5\,\csc(x)$$

a) $5\,\sec(x)\,\tan(x)\,-5\,\csc(x)\,\cot(x)$

b) $5\,\csc(x)\,+5\,\sec(x)$

c) $5\,\left(\sec(x)\right)^2+5\,\left(\csc(x)\right)^2$

d) $5\,\left(\tan(x)\right)^2+5\,\left(\cot(x)\right)^2$

e) $5\,\sec(x)\,\tan(x)\,+5\,\csc(x)\,\cot(x)$

7) Compute

$$\int_0^{\frac{1}{3}} \frac{9}{1+9\,t^2}\,dt$$

a) $\dfrac{1}{4}\,\pi$

b) 0

c) $\dfrac{1}{2}\,\pi$

d) $\dfrac{5}{4}\,\pi$

e) $\dfrac{3}{4}\,\pi$

8) Determine

$$\frac{d}{dx}\left(\frac{3x^4 - 4x}{3x^4 + 4x}\right)$$

a) $\dfrac{72x^2}{(3x^3 + 4)^2}$

b) $\dfrac{72x^2 - 1}{(3x^3 + 4)^2}$

c) $\dfrac{36x^2 - 1}{(3x^3 + 4)^2}$

d) $\dfrac{36x^2}{(3x^3 + 4)^2}$

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

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

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

at $x = \pi$.

a) -7

b) -5

c) -6

d) 3

e) 6

11) Compute

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

a) $\frac{4}{9}\left(x^3+4\right)^{(3/2)}+C$

b) $\frac{8}{9}\left(x^3+4\right)^{(3/2)}+C$

c) $\frac{4}{3}\left(x^3+4\right)^{(3/2)}+C$

d) $\frac{2}{3}\frac{1}{\sqrt{x^3+4}}+C$

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

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

$$f(x)=x^3-\frac{21}{2}x^2+30x-3$$

has a local minimum.

a) -5

b) 5

c) 2

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) -8

b) -4

c) 2

d) 4

e) 8

14) Compute

$$\int \left(5^x + 4\,e^{(5\ln(x))}\right)\,dx$$

a) $5^x \ln(5) + \frac{4}{5}\,\frac{e^{(5\ln(x))}}{x} + C$

b) $5^x \ln(5) + \frac{4}{5}\,e^{(5\ln(x))} + C$

c) $\frac{5^x}{\ln(5)} + \frac{2}{3}x^6 + C$

d) $\frac{5^x}{\ln(5)} + \frac{4}{5}\,e^{(5\ln(x))} + C$

e) $\frac{5^x}{\ln(5)} + \frac{4}{5}x^5 + C$

15) What is the average value of the function

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

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

a) $\frac{5}{3}$

b) 5

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

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

e) -4

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

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

at $t = 0$.

a) 8

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

c) 7

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

e) 9

18) Compute

$$\frac{d}{dx} 5^{\cos(x)}$$

a) $-\sin(x)\, 5^{\cos(x)}$

b) $\sin(x)\, 5^{\cos(x)} \ln(5)$

c) $-\sin(x)\, 5^{\cos(x)} \ln(5)$

d) $-\frac{\sin(x)\, 5^{\cos(x)}}{\ln(5)}$

e) $\dfrac{\sin(x)\ 5^{\cos(x)}}{\ln(5)}$

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

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

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

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

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

20) Compute

$$\lim_{x \to 0} \left(-\frac{2x}{\sin(4x)} + \frac{x}{\cos(4x)} \right)$$

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

b) *undefined*

c) 0

d) $\dfrac{-1}{4}$

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

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

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

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

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) $\frac{2}{3}$

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

c) 1

d) 0

e) -1

26) Determine the derivative of

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

at $x = \pi/2$.

a) $18\,(\cos(\pi+3))^2$

b) $-6\ (\cos(\pi+3))^2 \sin(\pi+3)$

c) $18\ (\cos(\pi+3))^2 \sin(\pi+3)$

d) $-6\cos(\pi+3)^2 \sin(\pi+3)$

e) $-6\ (\cos(\pi+3))^2$

27) Compute the derivative of

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

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

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

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

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

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

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

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

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

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

on the interval [1,3].

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

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

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

d) 2

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

2) The function

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

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

a) 1

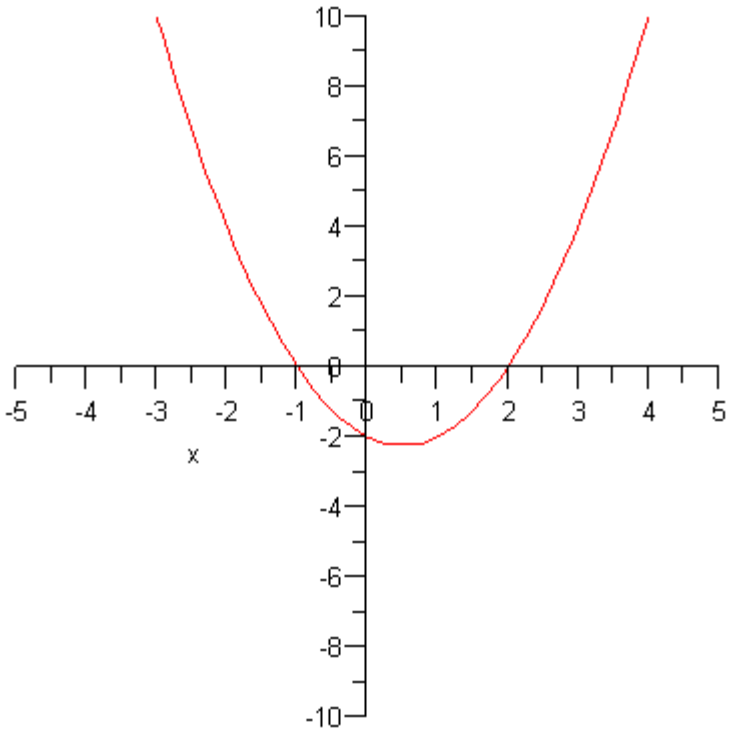
b) $\frac{1}{6 + 9e^3}$

c) $6 + 9e^3$

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) $\frac{1}{2}$

b) -1

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

$$\left[\int_0^{50} 5\, f(x)\ dx = 5,\ \int_2^{50} f(x)\ dx = -5\right]$$

Determine

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

a) -8

b) *There is not enough information.*

c) 12

d) 6

e) -4

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

$$f(x) = 5x^3 + 3x^2 - 3x$$

a) $(0.2898, -.4271)$

b) $(0.2898, -.4958)$

c) $(-.6898, 1.787)$

d) $(-.6898, -.4958)$

e) $(-.6898, 1.855)$

7) Give the approximate average value of the function

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

over the interval [1,4].

a) 11.03823889

b) 7.791

c) 8.39

d) 12.39

e) 10.39

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) 1.676

b) 0.7855

c) 0.8380

d) 1.047

e) 2.356

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

$$f(t) = \int_0^{8t} \cos(x)\ dx$$

at $t = \pi/7$?
a) -7.207

b) $-.9009$

c) 3.473

d) 0.4341

e) -1.030

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) 0.032

b) 0.051

c) 0.059

d) 0.109

e) 0.011

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

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

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) $21,250
b) $4,500
c) $18,350
d) $32,560
e) $16,250
12) A particle moves with acceleration

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

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 2 square meters and the radius is increasing at the rate of 1/3 meters per minute?
a) 0.6667

b) 0.7000

c) 2.128

d) 1.080

e) 1.714

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

$$y = e^{(-5x^2)}$$

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

a) −.6324

b) 0.6324

c) 0.3836

d) 1.043

e) 0.3452

15) A rough approximation for ln(5) is 1.609. Use this approximation and differentials to approximate ln(259/50).

a) 1.591

b) 1.644

c) 1.573

d) 1.645

e) 1.627

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

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

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

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

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

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

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