APAB S.Hogan

Chapter 2 Review

Directions: The exam will consist of **9 multiple-choice questions** and **2 free-response questions** from released AP exams.

YOU WILL NOT BE PERMITTED TO USE A CALCULATOR ON ANY PORTION OF THE EXAM!!!

On the review, you may use a calculator on the multiple-choice questions (#1-21) only to calculate numerical values because the related rates questions include difficult decimal values.

1	A 31 ft ladder leans against a wall. The bottom of the ladder is 3 feet from the wall at time t = 0 and slides away from the wall at a rate of 2.7 ft/s. Find the velocity of the ladder at time t = 5 seconds. A. -4.294 ft/s B. 1.698 ft/s C. -1.698 ft/s D. 4.294 ft/s E. None of the above
2	Water pours into a conical tank of height 9 ft and radius 2 ft at a rate of 2.7 ft^3/min. How fast is the water level rising when it is 3 ft high? A. 0.014 ft/min B. 5.801 ft/min C. 0.628 ft/min D. 12.723 ft/min E. None of the above
3	If $y^7 = x^2 + x - 1$, find $\frac{dy}{dx}$ A. $\frac{dy}{dx} = \frac{2x + 1}{y^7}$ B. $\frac{dy}{dx} = \frac{2x + 1}{7y^6}$ C. $\frac{dy}{dx} = \frac{2x + 1}{6y}$ D. $\frac{dy}{dx} = 2x + 1$ E. None of the above

4	Water pours into a fishtank at a rate of 4.9 ft^3/min. How fast is the water level rising if the base of the tank is a rectangle with dimensions 1 ft by 6 ft? A. -29.4 ft/min B. 29.4 ft/min C. 0.817 ft/min D. -0.817 ft/min E. None of the above
5	What is the derivative of: $r(x) = \sin(4x^3 + 3x^2 + x - 3)$? A. $[-\cos(4x^3 + 3x^2 + x - 3)](12x^2 + 6x + 1)$ B. $[\sin(4x^3 + 3x^2 + x - 3)](12x^2 + 6x + 1)$ C. $[\cos(4x^3 + 3x^2 + x - 3)](12x^2 + 6x + 1)$ D. $[-\sin(4x^3 + 3x^2 + x - 3)](12x^2 + 6x + 1)$ E. None of the above
6	If $y^3 + xy = -x + 2$, find $\frac{dy}{dx}$ A. $\frac{dy}{dx} = \frac{-1 - y}{3y^2 + x}$ B. $\frac{dy}{dx} = \frac{-1}{3y^2 + x}$ C. $\frac{dy}{dx} = \frac{-1 - y}{3y^2}$ D. $\frac{dy}{dx} = \frac{-1}{3y^2}$ E. None of the above

7

Given $m(x) = \cos^5(x - 3)$. What is $m'(x)$?

A. $(-5)[\cos^4(x - 3)][\sin(x - 3)]$

B. $(5)[\cos^4(x - 3)][\sin(x - 3)]$

C. $(5)[\sin^4(x - 3)][\cos(x - 3)]$

D. $(-5)[\sin^4(x - 3)][\cos(x - 3)]$

E. None of the above

8

Given $h(x) = \cos^5(x)$. What is $h'(x)$?

A. $-5(\cos^4 x)(\sin x)$

B. $[\cos(-5x^2 + 4x + 2)](-10x + 4)$

C. $5(\sin^4 x)(\cos x)$

D. $[-\sin(-5x^2 + 4x + 2)](-10x + 4)$

E. None of the above

9

Water pours into a conical tank of height 5 ft and radius 1 ft at a rate of 2.2 ft^3/min. How fast is the water level rising when it is 3 ft high?

A. 11.519 ft/min
B. 0.009 ft/min
C. 0.461 ft/min
D. 5.836 ft/min

E. None of the above

10 One train travels west at 160 mph towards Traveler's Town, while a second train travels south at 200 mph away from Traveler's Town. At time t = 0, the first train is 70 miles east and the second train is 90 miles south. Find the rate at which the distance between the trains is changing at time t = 50 minutes.

A. 350.021 mph
B. 59.514 mph
C. 107.427 mph
D. 155.845 mph

E. None of the above

11 What is the derivative of: $b(x) = \sec(e^{-5x^2+4})$?

A. $(-10x)e^{-5x^2+4}(\sec e^{-5x^2+4})(\tan e^{-5x^2+4})$

B. $(-10x)e^{-5x^2+4}(-\csc e^{-5x^2+4})(\cot e^{-5x^2+4})$

C. $(-10x)e^{-5x^2+4}(-\csc^2 e^{-5x^2+4})$

D. $(-10x)e^{-5x^2+4}(\sec^2 e^{-5x^2+4})$

E. None of the above

12 If $2x^2y + 4y^3 = 0$, find $\frac{dy}{dx}$

A. $\frac{dy}{dx} = 2x^2 + 12y^2$

B. $\frac{dy}{dx} = -4xy$

C. $\frac{dy}{dx} = \frac{-4xy}{2x^2 + 12y^2}$

D. $\frac{dy}{dx} = \frac{2x^2 + 12y^2}{-4xy}$

E. None of the above

13 Find the equation of the tangent line to the graph of $q(x) = -2$ at $x = 0$.

A. $y = -2$
B. $y = 2$
C. $y = 2x$
D. $y = -2x$
E. None of the above

14 Given $r(x) = (-5x^3 + 3x^2 + 5x - 5)^{80}$

What is $\frac{dr}{dx}$?

A. $79(-5x^3 + 3x^2 + 5x - 5)^{80}(-15x^2 + 6x + 5)$

B. $80(-5x^3 + 3x^2 + 5x - 5)^{79}(-15x^2 + 6x + 5)$

C. $79(-15x^2 + 6x + 5)^{80}(-5x^3 + 3x^2 + 5x - 5)$

D. $80(-15x^2 + 6x + 5)^{79}(-5x^3 + 3x^2 + 5x - 5)$

E. None of the above

15 Given $v(x) = \csc(e^{-3x+4})$

What is $\frac{dv}{dx}$?

A. $(-3)e^{-3x+4}(-\csc e^{-3x+4})(\cot e^{-3x+4})$

B. $(-3)e^{-3x+4}(-\sin e^{-3x+4})$

C. $(-3)e^{-3x+4}(\sec e^{-3x+4})(\tan e^{-3x+4})$

D. $(-3)e^{-3x+4}(-\csc^2 e^{-3x+4})$

E. None of the above

16 Find the equation of the tangent line to the graph of $z(x) = -4x + 2$ at $x = -1$.

A. $y = -2x - 4$
B. $y = 2x - 4$
C. $y = -4x - 2$
D. $y = -4x + 2$

E. None of the above

17 If $4x^3 + 2xy^2 + 2y^3 = -2$, find $\frac{dy}{dx}$

A. $\frac{dy}{dx} = 4xy + 6y^2$

B. $\frac{dy}{dx} = \frac{4xy + 6y^2}{-12x^2 - 2y^2}$

C. $\frac{dy}{dx} = -12x^2 - 2y^2$

D. $\frac{dy}{dx} = \frac{-12x^2 - 2y^2}{4xy + 6y^2}$

E. None of the above

18 What is the derivative of: $c(x) = \cos^5(-5x^2 - 3x - 2)$?

A. $(-50x - 15)[\sin^4(-5x^2 - 3x - 2)][\cos(-5x^2 - 3x - 2)]$

B. $(50x + 15)[\sin^4(-5x^2 - 3x - 2)][\cos(-5x^2 - 3x - 2)]$

C. $(50x + 15)[\cos^4(-5x^2 - 3x - 2)][\sin(-5x^2 - 3x - 2)]$

D. $(-50x - 15)[\cos^4(-5x^2 - 3x - 2)][\sin(-5x^2 - 3x - 2)]$

E. None of the above

19 Find the equation of the tangent line to the graph of $g(x) = -3x^3 + 2x + 5$ at $x = 0$.

A. $y = 5x + 2$
B. $y = -5x + 2$
C. $y = 2x - 5$
D. $y = 2x + 5$
E. None of the above

20 Find the equation of the tangent line to the graph of $c(x) = -2x^3 + 5x^2 - 5$ at $x = -1$.

A. $y = -14x - 16$
B. $y = -16x - 14$
C. $y = -16x + 14$
D. $y = 14x - 16$

E. None of the above

21 If $y^6 + xy = 2x^3 - 5x - 2$, find $\frac{dy}{dx}$

A. $\frac{dy}{dx} = \frac{6x^2 - 5}{6y^5}$
B. $\frac{dy}{dx} = \frac{6x^2 - 5}{6y^5 + x}$
C. $\frac{dy}{dx} = \frac{6x^2 - 5 - y}{6y^5}$
D. $\frac{dy}{dx} = \frac{6x^2 - 5 - y}{6y^5 + x}$

E. None of the above

22 Consider the curve defined by $x^2 + xy + y^2 = 27$.

(a) Write an expression for the slope of the curve at any point (x, y).

(b) Determine whether the lines tangent to the curve at the x-intercepts of the curve are parallel. Show the analysis that leads to your conclusion.

(c) Find the points on the curve where the lines tangent to the curve are vertical.

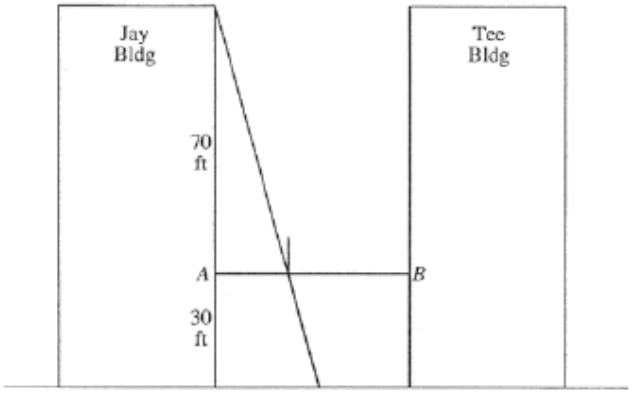
23 The radius r of a sphere is increasing at a constant rate of 0.04 centimeters per second. (Note: The volume of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.)

(a) At the time when the radius of the sphere is 10 centimeters, what is the rate of increase of its volume?

(b) At the time when the volume of the sphere is 36π cubic centimeters, what is the rate of increase of the area of a cross section through the center of the sphere?

(c) At the time when the volume and the radius of the sphere are increasing at the same numerical rate, what is the radius?

24 A tight rope is stretched 30 feet above the ground between the Jay and the Tee buildings, which are 50 feet apart. A tightrope walker, walking at a constant rate of 2 feet per second from point A to point B, is illuminated by a spotlight 70 feet above point A, as shown in the diagram.



(a) How fast is the shadow of the tightrope walker's feet moving along the ground when she is midway between the buildings? (Indicate units of measure.)

(b) How far from point A is the tightrope walker when the shadow of her feet reaches the base of the Tee Building? (Indicate units of measure.)

(c) How fast is the shadow of the tightrope walker's feet moving up the wall of the Tee Building when she is 10 feet from point B? (Indicate units of measure.)

PLEASE NOTE THAT ANY MATERIAL WE HAVE COVERED IN CALCULUS, AS WELL AS ANY PREREQUISITE KNOWLEDGE FROM PRECALCULUS, ALGEBRA, AND GEOMETRY, MAY APPEAR ON THIS EXAMINATION. PREPARE THOROUGHLY. BE FAST. BE RIGHT.