APAB S.Hogan

Chapter 3 Review

Directions: The exam will consist of 9 multiple-choice questions and 2 free response questions on a variety of topics. All questions will be from released AP examinations. THIS REVIEW also has 18 multiple-choice questions (from a test generator) and 4 free-response questions (from released AP exams). BOTH SECTIONS WILL BE NON-CALCULATOR. (Although you will need a calculator for the review multiple-choice.)

1	Find the slope of the tangent line to $h(x) = \sqrt{x+3}$ at the point $(6, 3)$. A. $^1/_6$ B. 6 C. 3 D. $^1/_3$ E. None of the above
2	What is the derivative of $y(x) = -2 \sin x$? A. $-2 \sin x$ B. $-2 \cos x$ C. $2 \cos x$ D. $2 \sin x$ E. None of the above
3	What is $\frac{d}{dx}[(-3x^2 - 4x + 3)(\sin x)]$? A. $-3x^2\sin x - 10x\sin x - \sin x - 3x^2\cos x - 4x\cos x + 3\cos x$ B. $-6x\sin x - 4\sin x - 3x^2\cos x - 4x\cos x + 3\cos x$ C. $-3x^2\sin x - 10x\sin x - \sin x$ D. $-6x\sin x - 4\sin x + 3x^2\cos x - 4x\cos x + 3\cos x$ E. None of the above

4

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

A. $\frac{dy}{dx} = \frac{-6x + 4}{3y}$

B. $\frac{dy}{dx} = -6x + 4$

C. $\frac{dy}{dx} = \frac{-6x + 4}{y^4}$

D. $\frac{dy}{dx} = \frac{-6x + 4}{4y^3}$

E. None of the above

5

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

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

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

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

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

E. None of the above

6

Find the equation of the tangent line to $y^4 = 3x^2 - 3x - 5$ going through (-1,-1).

A. $y = {}^{-9}/_{4}\,x + {}^{5}/_{4}$

B. $y = {}^{-9}/_{4}\,x - {}^{5}/_{4}$

C. $y = {}^{9}/_{4}\,x - {}^{5}/_{4}$

D. $y = {}^{9}/_{4}\,x + {}^{5}/_{4}$

E. None of the above

7	One train travels east at 150 mph towards Challenge City, while a second train travels south at 160 mph away from Challenge City. At time t = 0, the first train is 10 miles west and the second train is 80 miles south. Find the rate at which the distance between the trains is changing at time t = 30 minutes. A. 91.778 mph B. 18.529 mph C. 240.013 mph D. 78.75 mph E. None of the above
8	A 16 ft ladder leans against a wall. The bottom of the ladder is 2 feet from the wall at time t = 0 and slides away from the wall at a rate of 1 ft/s. Find the velocity of the ladder at time t = 3 seconds. A. 3.04 ft/s B. -3.04 ft/s C. 0.329 ft/s D. -0.329 ft/s E. None of the above
9	Find all critical points of $y(x) = \|5x + 2\|$. A. $x = {}^{-2}/_{5}$ B. $x = {}^{3}/_{5}$ C. There are no critical points. D. $x = {}^{-7}/_{5}$ E. None of the above
10	Find all critical points of $b(x) = \frac{x^2}{4x - 2}$ A. $x = {}^{1}/_{2}$ B. $x = 0$ C. $x = {}^{1}/_{2}$ and $x = 1$ D. $x = 1$ and $x = 0$ E. None of the above

11

Find all critical points of $k(x) = -2x^3 - 13x^2 - 8x + 19$.

A. $x = -1$ and $x = -4$.

B. $x = {}^{-1}/_{3}$ and $x = -4$.

C. $x = {}^{-1}/_{3}$ and $x = {}^{-4}/_{3}$.

D. $x = -1$ and $x = {}^{-4}/_{3}$.

E. None of the above

12

Given $u(x) = \dfrac{e^x}{x - 2}$.

What is $u'(x)$?

A. $\dfrac{xe^x - 3e^x}{x^2 - 4x + 4}$

B. $\dfrac{\dfrac{xe^x - 2e^x + xe^x - 3e^x}{xe^x - 2e^x}}{}$

C. $\dfrac{\dfrac{xe^x - 2e^x + xe^x - 3e^x}{x^2 - 4x + 4}}{}$

D. $\dfrac{\dfrac{xe^x - 3e^x}{xe^x - 2e^x}}{}$

E. None of the above

13

Find the intervals on which $t(x) = x^3 + 9x^2 + 24x - 2$ is increasing or decreasing.

A. Increasing: $(-\infty,-4) \cup (-2,\infty)$
Decreasing: $(-4,-2)$

B. Increasing: $[-4,-2]$
Decreasing: $(-\infty,-4] \cup [-2,\infty)$

C. Increasing: $(-\infty,-4] \cup [-2,\infty)$
Decreasing: $[-4,-2]$

D. Increasing: $(-4,-2)$
Decreasing: $(-\infty,-4) \cup (-2,\infty)$

E. None of the above

14 Suppose $h(-1) = 0$ and $(hp)'(-1) = 44$. Find $p(-1)$ assuming $h'(-1) = 11$.

A. $p(-1)=55$
B. $p(-1)=33$
C. $p(-1)=4$
D. $p(-1)=484$

E. None of the above

15 Apply the first derivative test on $q(x) = x^3 - 3x^2 - 24x - 4$ to find all local maximum and minimums.

A. No Local Maximum or Minimum.
B. Local Maximum: $x = -2$ and $x = 4$
C. Local Maximum: $x = -2$, Local Minimum $x = 4$
D. Local Maximum: $x = 4$, Local Minimum $x = -2$

E. None of the above

16 Find the intervals on which $b(x) = -x^3 + 12x + 4$ is concave up or down.

A. Up: $(-\infty,2] \cup [-2,\infty)$ and Down: $[2,-2]$
B. Up: $(-\infty,0)$ and Down: $(0,\infty)$
C. Up: $(-\infty,2) \cup (-2,\infty)$ and Down: $(2,-2)$
D. Up: $(0,\infty)$ and Down: $(-\infty,0)$

E. None of the above

17 Find all inflection points of $d(x) = 3x^5 - 15x^4 + 30x^3 - 30x^2 + 4x - 5$.

A. $x = 1$
B. There are no inflection points.
C. $x = -1$
D. $x = 1, x = -1$

E. None of the above

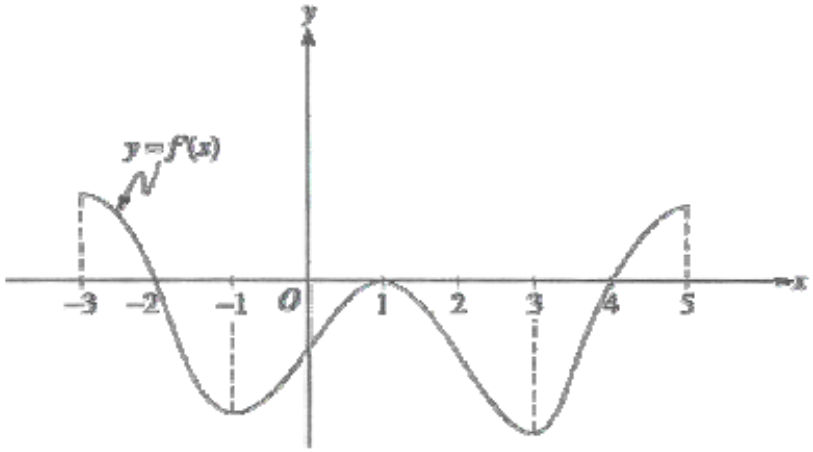
18 Apply the second derivative test on $a(x) = -x^3 - 6x^2 - 12x + 3$ to find all local maximum and minimums.

A. Local Maximum: $x = 2$
B. Local Minimum: $x = 2$
C. Local Maximum: $x = 3$
D. The test is inconclusive.

E. None of the above

1

1996 AB1



Note: This is the graph of the derivative of f, not the graph of f.

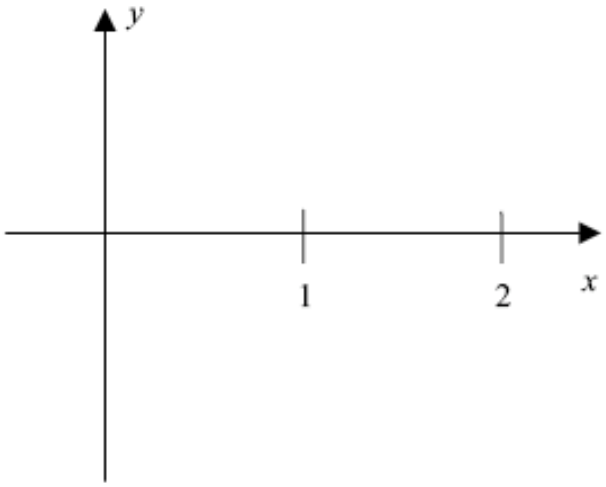
The figure above shows the graph of f', the derivative of a function f. The domain of f is the set of all real numbers x such that $-3 < x < 5$.

(a) For what values of x does f have a relative maximum? Why?

(b) For what values of x does f have a relative minimum? Why?

(c) On what intervals is the graph of f concave upward? Use f' to justify your answer.

(d) Suppose that $f(1) = 0$. In the xy-plane provided, draw a sketch that shows the general shape of the graph of the function f on the open interval $0 < x < 2$.



2	**1971 AB3** Consider $f(x) = \cos^2 x + 2\cos x$ over one complete period beginning with $x = 0$. (a) Find all values of x in this period at which $f(x) = 0$. (b) Find all values of x in this period at which the function has a minimum. Justify your answer. (c) Over what intervals in this period is the curve concave up?

3 **1984 AB4/BC3**

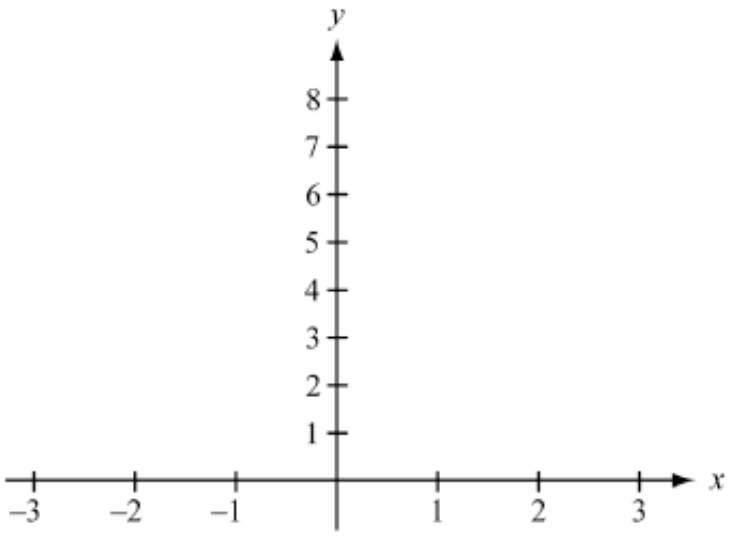
A function f is continuous on the closed interval $[-3, 3]$ such that $f(-3) = 4$ and $f(3) = 1$. The functions f' and f'' have the properties given in the table below.

x	$-3 < x < -1$	$x = -1$	$-1 < x < 1$	$x = 1$	$1 < x < 3$
$f'(x)$	Positive	Fails to exist	Negative	0	Negative
$f''(x)$	Positive	Fails to exist	Positive	0	Negative

(a) What are the x-coordinates of all absolute maximum and absolute minimum points of f on the interval $[-3, 3]$? Justify your answer.

(b) What are the x-coordinates of all points of inflection of f on the interval $[-3, 3]$? Justify your answer.

(c) On the axes provided, sketch a graph that satisfies the given properties of f.



4 **1994 AB 1**

Let f be the function given by $f(x) = 3x^4 + x^3 - 21x^2$.

(a) Write an equation of the line tangent to the graph of f at the point $(2, -28)$.

(b) Find the absolute minimum value of f. Show the analysis that leads to your conclusion.

(c) Find the x-coordinate of each point of inflection on the graph of f. Show the analysis that leads to your conclusion.