

Review Chapter 4 Cat #6 Ch. 4 Calculus BC

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Category #6

The volume V of a cone is increasing at the rate of 28π cubic units per second. At the instant when the radius r of the cone is 3 units, its volume is 12π cubic units and the radius is increasing at $1/2$ unit per second.

- A) At the instant when the radius of the cone is 3 units, what is the rate of change of the area of its base?
- B) At the instant when the radius of the cone is 3 units, what is the rate of change of its height h ?
- C) At the instant when the radius of the cone is 3 units, what is the instantaneous rate of change of the area of its base with respect to its height?

Cat #6 Ch. 4

②

Category #6

- A) A point moves on a hyperbola $3x^2 - y^2 = 23$ so that its y -coordinate is increasing at a constant rate of 4 units per second. How fast is the x -coordinate changing when $x=4$?
- B) For what values of k will the line $2x + 9y + k = 0$ be normal to the hyperbola $3x^2 - y^2 = 23$?

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Category #7

A tank with a rectangular base and rectangular sides is to be open at the top. It is to be constructed so that its width is 4 meters and its volume is 36 cubic meters. If building the tank costs \$10 per square meter for the base and \$5 per square meter for the sides, what is the cost of the least expensive tank? Justify.

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Category #8

Ch. 4

Consider the function. $f(x) = x^{4/3} + 4x^{1/3}$ on $-8 \leq x \leq 8$

- A) Find the coordinates of all points at which the tangent to the curve is a horizontal line.
- B) Find the coordinates of all points at which the tangent to the curve is a vertical line.
- C) Find the coordinates of the points at which the absolute max and absolute minimum occur.
- D) For what values of x is this function concave down
- E) Graph. $-8 \leq x \leq 8$

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Category #8 Ch 4

A function f is continuous on the interval $(-\infty, \infty)$ such that: $f(-4) = 8$, $f(0) = 0$, $f(2) = 2$, $f(4) = 4$. The functions f' and f'' have these properties:

x	$-4 < x < 0$	$x = 0$	$0 < x < 2$	$x = 2$	$2 < x < 4$	$x = 4$	$x > 4$
f'	-	\cup	+	0	+	\cup	-
f''	+	\cup	-	0	+	\cup	+

- A) What are the x -coordinates of all absolute max and abs min pts of f on the interval $[-4, 4]$ Justify
- B) What are the x -coordinates of all points of inflection of f on the interval $[-4, \infty)$ Justify
- C) Sketch

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Category #7

Ch. 4

A rectangle ABCD with sides parallel to the coordinates axes is inscribed in the region enclosed by the graph of $y = -4x^2 + 4$ and the x-axis,

- A) Find the x and y coordinates of C so that the area of rectangle ABCD is a maximum.
- B) The point C moves along the curve with its x-coordinate increasing at the constant rate of 2 units per second. Find the rate of change of the area of rectangle ABCD when $x = 1/2$

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Category #2

Ch. 4

Find the equation in point-slope form of the lines (there are two) through the point (5,9) which is tangent to the graph of $y = x^2$

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Category #2

Ch. 4

Find the equation in point-slope form of the tangent line to the graph of $y = 3x^2 + 4x - 6$ which is parallel to the line $5x - 2y - 1 = 0$

9.

Category #4

Ch. 4

A particle moves on the x-axis in such a way that its position at time t is given by $x(t) = (2t-1)(t-1)^2$

- A) At what time t is the particle at rest?
- B) During what interval of time is the particle moving left? Justify.
- C) At what time during the interval found in (b) is the particle moving most rapidly (speed = $|\text{velocity}|$)

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Category # 6 Ch. 4

- A) A softball diamond has the shape of a square with sides 60 ft long. If a player is running from second base to third base a speed of 24 ft/sec. At what rate is her distance from home plate changing when she is 20 ft. from third?
- B) A spherical snowball is melting and the radius is decreasing at a constant rate, changing from 12" to 8" in 45 min. How fast was the Volume changing when radius was 10"?

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Category # 3

Ch. 4

- A) If $y = \sqrt{2x^2 - 1}$, then the derivatives of y^2 with respect to x^2 is
- B) If $y = 3x^2 + x$, then the derivative of y with respect to $\frac{1}{x}$ is

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Category # 8

Ch. 4

Determine the following about the graph $y = \frac{8}{x^3} - \frac{6}{x}$

- A) If the graph symmetric to
- 1) The x-axis
 - 2) The y-axis
 - 3) The origin
- B) Find the x-coordinates of each point at which y is a local max and local min. Justify.
- C) Find the x-coordinates of each point of inflection. Justify.

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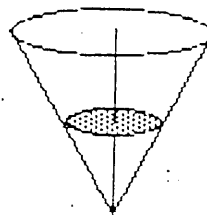
Category # 6

Ch. 4

A conical reservoir has a depth of 24 feet and a circular top of radius 12 feet.

It is being filled so that the depth of water is increasing at a constant rate of 4 feet per hour.

Determine the rate in cubic feet per hour at which water is entering the reservoir when the depth is 5 feet.



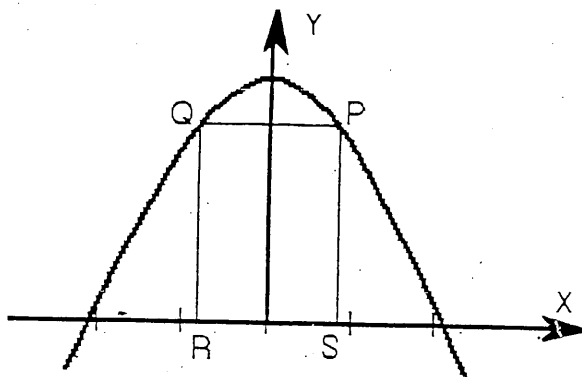
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Category # 7

Ch. 4

A rectangle PQRS is inscribed, as sketched, in the region between the X-axis and the part of the graph $y = \cos 4x$

specified by $-\frac{\pi}{8} \leq x \leq \frac{\pi}{8}$



Determine the coordinates of P for which the perimeter of PQRS is a maximum.

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Category # 2

Ch. 4.

Given the function f defined by $f(x) = x^3 - x^2 - 4x + 4$.

(a) Find the zeros of f .

(b) Write an equation of the line tangent to the graph of f at $x = -1$.

(c) The point (a, b) is on the graph of f and the line tangent to the graph at (a, b) passes through the point $(0, -8)$ which is not on the graph of f . Find the values of a and b .