

Calculus Test

Calculate the limits.

1) $\lim_{k \rightarrow \infty} \frac{\sin(k)}{k}$

0

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Calculus INDIVIDUAL 2018

2) $\lim_{h \rightarrow 0} \frac{1 - e^h}{h}$

$$\frac{1 - e^h}{h} = \frac{-e^h}{1} = -e^0 = -1$$

$$\frac{4}{-15u^4}$$

3) $\lim_{w \rightarrow \infty} \frac{9w^4 + 13w - 1300}{1297w - 15w^4}$

$$\frac{9w^4}{-15w^4} = \left(\frac{9}{-15}\right)$$

$$-\frac{9}{15} = -\frac{3}{5}$$

4) $\lim_{x \rightarrow -6} \frac{x^3 + 216}{x^2 - 2x - 24}$

$$\frac{36+12-24}{(x+6)(x^2-6x+36)} = \frac{48}{(x+6)(x^2-6x+36)}$$

$$(x+a)^3$$

$$36+12-24$$

$$\frac{36+12-24}{(x+6)(x^2-6x+36)} = \frac{12}{(x+6)(x^2-6x+36)}$$

$$\begin{aligned} & (x+a)(x^2-ax+a^2) \\ & x^3 - ax^2 + a^2x \\ & ax^2 - a^2x + a^3 \\ & \frac{1}{3} + \frac{9}{3} = \frac{10}{3} \end{aligned}$$

5) $\lim_{x \rightarrow 11} \frac{|11-x|}{11-x}$

$$16 \text{ or } -9$$

$$\frac{11-11}{11-11}$$

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$[-1, 4) \cup (4, \infty)$

Find the intervals on which the function is continuous.

6) $A(x) = \frac{\sqrt{x+1}}{x-4}$

$$(-\infty, 4) \cup (4, \infty)$$

$$y = -\frac{1}{6}x + 3 \quad \frac{10}{3}$$

$$x \geq -1$$

Make an equation (in slope intercept form) of the tangent line to the curve at the given x value.

7) $C(x) = \sqrt{11-x} \quad x = 2$

$$y - 3 = -\frac{1}{6}(x-2)$$

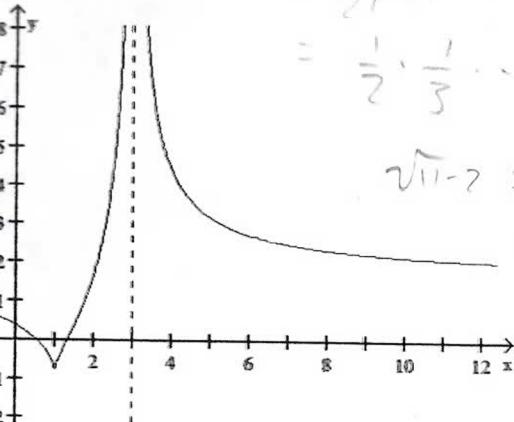
$$C'(x) = \frac{1}{2}(11-x)^{-1/2}(-1)$$

$$= \frac{1}{2}(-1)^{-1/2}(-1)$$

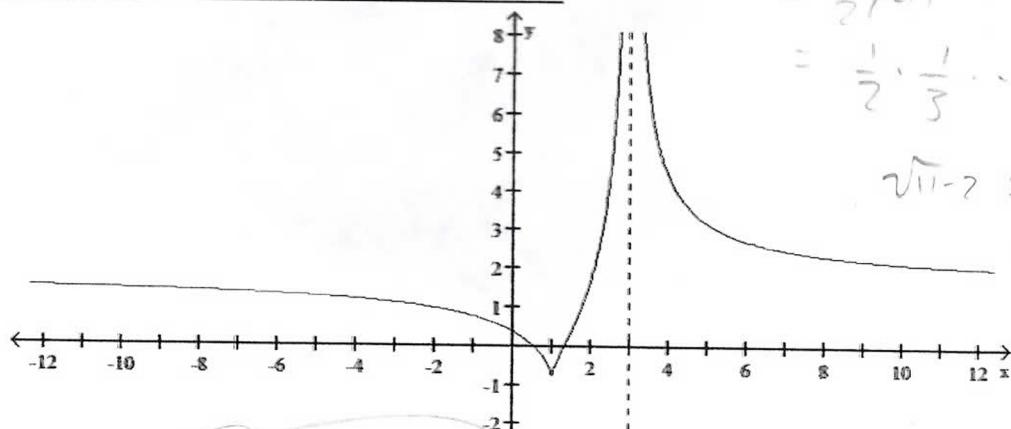
$$= \frac{1}{2} \cdot \frac{1}{\sqrt{3}} \cdot -1 = -\frac{1}{6}$$

$$\sqrt{11-2} = \sqrt{9}$$

$$(2, 3)$$



8) Locate where the derivative does not exist.



$$\begin{aligned} & y - 3 = -\frac{1}{6}(x-2) \\ & y = -\frac{1}{6}x + \frac{20}{3} \end{aligned}$$

Find the derivative of the function.

$$9) \beta(x) = \ln\left(\frac{7x}{x+4}\right)$$

$$\frac{1}{7x} \cdot \frac{(x+4)(7) - (7x)(1)}{(x+4)^2} = \frac{7x + 28 - 7x}{(x+4)^2} = \frac{28}{(x+4)^2}$$

List the interval(s) where the function is concave down.

$$10) d(x) = x^3 - 6x^2 + 16$$

$$\frac{x+4}{7x} \cdot \frac{28}{(x+4)^2} = \frac{28}{7x(x+4)}$$

Compute the expression.

$$11) \frac{d}{dx} \int_3^{2x} \cos(t) dt$$

$3x^2 - 12x$
 $6x - 12 = 0$
 $x = 2$
 $(\cos(2x)) \cdot 2$

$$\begin{array}{c} - \\ \hline 1 & + \\ \hline 2 \\ (-\infty, 2) \end{array}$$

$$\frac{4}{x(x+4)}$$

$$12) \int_{-2}^2 x \sqrt{2-x^2} dx$$

$$-\frac{1}{2} \int u^{1/2} du$$

$$u = 2 - x^2
du = -2x dx
-\frac{1}{2} \left[\frac{u^{1/2}}{10} \right] + C$$

$$-\frac{9(2-x^2)^{1/2}}{20} + C$$

$$13) \sum_{k=1}^{24} (7 + 5k)$$

$$\sum_{k=1}^{24} 7 + 5 \sum_{k=1}^{24} k$$

$$5 + 10 + 15 + \dots + 120$$

$$128 + 24$$

14) Compute the area of the region bounded by the x-axis and the function $g(x) = \sin(x)$ on the interval $[-\pi, \pi]$.

⑥



$$\frac{3\pi}{10}$$

$$[3x^2 - 7]^2$$

15) Compute the average value of $A(x) = x^3 - 2x + 1$ on $[-2, 2]$

$$\frac{\int_{-2}^2 x^3 - 2x + 1}{2+2} = \frac{0}{4} = 0$$

Solve the problems.

16) A ball thrown upward from the top of a building has a height of $h = 128 + 32t - 16t^2$ feet after t seconds.

a.) At what time does the ball turn around?

1 sec

$$32t - 32 = 0$$

b.) How long does it take the ball to reach the ground?

$$4 \sec$$

$$32 - 32t = 0$$

c.) What is the ball's velocity at the moment of impact?

$$-96$$

$$t = 1$$

17) A farmer plans to enclose a rectangular pasture adjacent to a river.

The pasture must contain 900 square meters to provide enough grass for the herd.

He wishes to divide it into 3 equal rectangular portions.

No fencing is needed along the river.

What dimensions will require the least amount of fencing?

40 by 15