Calculus 1
Final Exam Review 1

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Evaluate $\lim_{x \to 2} \frac{x-2}{x^2-4}$.

a) $\frac{1}{4}$

b) $\frac{-1}{16}$

c) $\frac{1}{16}$

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

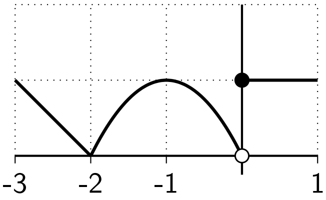
e) 0

f) Does Not Exist

Limits

Evaluate each limit. If the limit does not exist explain why.

1. $\lim_{x \to 0^+} f(x)$.



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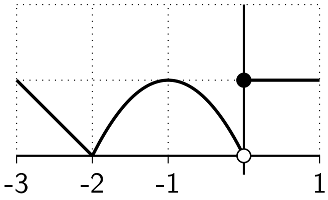

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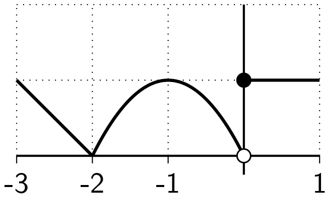

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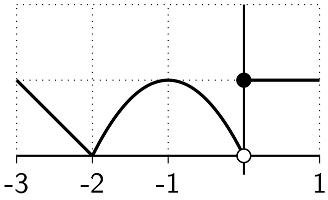
2. $\lim\limits_{x \to 0^-} f(x)$.
3. $\lim\limits_{x \to 0} f(x)$.
4. $\lim\limits_{x \to -1} f(x)$.



Definition of Derivative

Use the definition of derivative to find $f'(x)$ for the function $f(x) = 3x^2 - 1$.

Related Rates

A ruptured oil tanker causes a circular oil slick on the surface of the ocean. When the radius is 200 meters, it is expanding at a rate of 0.2meters/minute. What is the rate at which the area of the oil slick is changing?

Critical Points

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a) Find all the critical points for $f(x)$.

b) Find the global maximum and global minimum for $f(x)$ over the closed interval $[-1, 32]$.

Optimization

A company needs to produce a bottomed square rectangular box with a volume of 4 cubic feet. The box has no top, just sides and a bottom. Provide the dimensions of the box that uses the least amount of material.

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Which of the following is the exact solution to $\frac{d}{dx}\int_1^x t^2 dt$?

a) $2x$

b) x^2

c) $\frac{x^3}{2}$

d) $x^2 - 1$

e) 0

Parametric Curves

Consider the parametric curve given by $x(t) = t^4 - 2t$, $y(t) = 4t + 2t^3$.

a) Find the slope of the tangent line to the parametric curve.

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a) Find the slope of the tangent line to the parametric curve.

b) Find the equation of the tangent line to the parametric curve at the point where $t = 1$

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Which sum would properly give a **left-hand** sum estimate of the area under the curve $f(x) = x^2$ between 0 and 2 using 4 subdivisions?

a) $0 \cdot 0 + \frac{1}{4} \cdot \frac{1}{2} + 1 \cdot 1 + \frac{9}{4} \cdot \frac{3}{2}$

b) $0 \cdot \frac{1}{2} + \frac{1}{4} \cdot \frac{1}{2} + 1 \cdot \frac{1}{2} + \frac{9}{4} \cdot \frac{1}{2}$

c) $\frac{1}{4} \cdot \frac{1}{2} + 1 \cdot 1 + \frac{9}{4} \cdot \frac{3}{2} + 4 \cdot 2$

d) $\frac{1}{4} \cdot \frac{1}{2} + 1 \cdot \frac{1}{2} + \frac{9}{4} \cdot \frac{1}{2} + 4 \cdot \frac{1}{2}$

L'Hopital's Rule

Evaluate the following limits. If a limit does not exist, explain why.

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c) $\lim\limits_{x\to 0} \frac{\sin(x)-x}{6x^2}$

Integrals

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c) $\dfrac{d}{dx} \int_1^{x^2} \sqrt{1+t}\, dt$

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Given the graph of $f'(x)$ below. Clearly circle the graph that could represent $f(x)$.