

Calculus 1

Final Exam Review 1

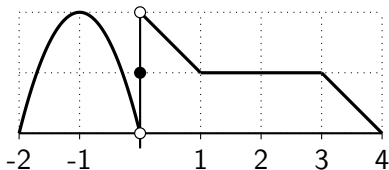
Table of contents

1 Practice Problems

Limits

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

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

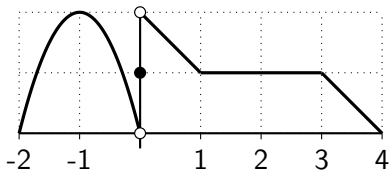


Limits

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

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

2 $\lim_{x \rightarrow 0^+} f(x).$



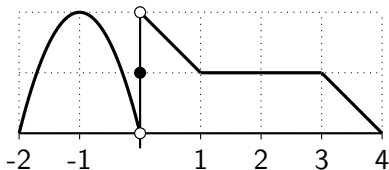
Limits

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

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

2 $\lim_{x \rightarrow 0^+} f(x).$

3 $\lim_{x \rightarrow 0} f(x).$



Limits

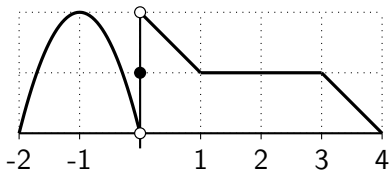
Evaluate each limit. If the limit does not exist explain why.

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

2 $\lim_{x \rightarrow 0^+} f(x).$

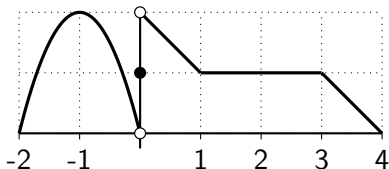
3 $\lim_{x \rightarrow 0} f(x).$

4 $\lim_{x \rightarrow -1} f(x).$



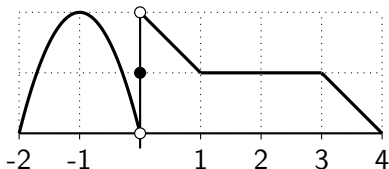
Continuity

- 1 At which x -values in the interval $(-2, 4)$, if any is the function not continuous?



Continuity

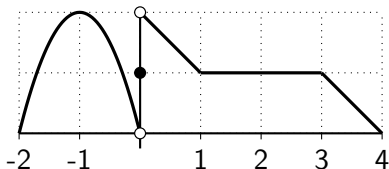
- 1 At which x -values in the interval $(-2, 4)$, if any is the function not continuous?
- 2 At which x -values in the interval $(-2, 4)$, if any is the function not differentiable?



Continuity

- 1 At which x -values in the interval $(-2, 4)$, if any is the function not continuous?
- 2 At which x -values in the interval $(-2, 4)$, if any is the function not differentiable?

- 3 Provide the value of $f'(2)$



Definition of Derivative

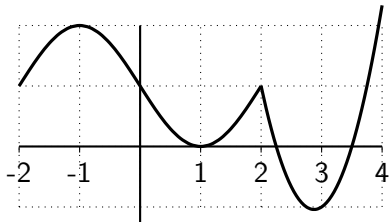
Use the definition of derivative to find $f'(x)$ for the function $f(x) = x^3 + 3$.

Related Rates

A bank at the intersection of a north-south road and an east-west road has just been robbed. A police car is traveling towards the bank from the south, chasing the getaway vehicle which is traveling east away from the bank. The speed of the police car is 100 mph at the instant it is 3 miles from the bank. At the same instant the getaway vehicle is 4 miles from the bank and is moving at a speed of 70 mph. At this instant what is the rate of change of the distance between the getaway car and the police car?

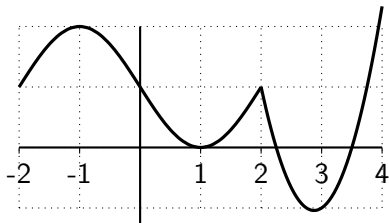
Critical Points

- 1 List all, if any, critical points in $(-2, 4)$.



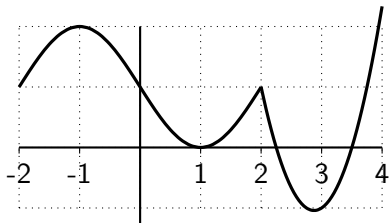
Critical Points

- 1 List all, if any, critical points in $(-2, 4)$.
- 2 At which values of x in the interval $(-2, 4)$, if any, is $f'(x) < 0$?



Critical Points

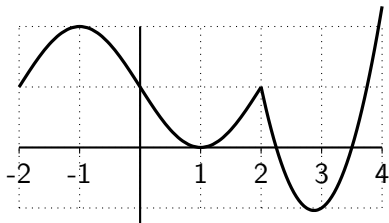
- 1 List all, if any, critical points in $(-2, 4)$.
- 2 At which values of x in the interval $(-2, 4)$, if any, is $f'(x) < 0$?
- 3 At which values of x in the interval $(-2, 4)$, if any, is $f''(x) < 0$?



Critical Points

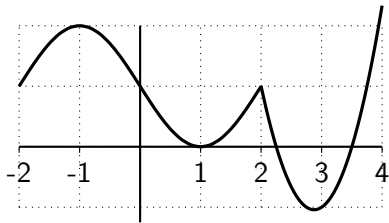
- ① List all, if any, critical points in $(-2, 4)$.
- ② At which values of x in the interval $(-2, 4)$, if any, is $f'(x) < 0$?
- ③ At which values of x in the interval $(-2, 4)$, if any, is $f''(x) < 0$?

- ④ List all, if any, inflection points in $(-2, 4)$.



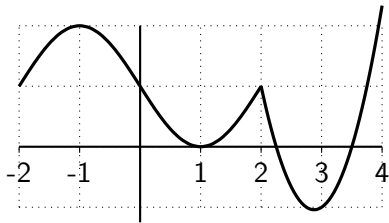
Critical Points

- ① List each, if there are any, local maximum for $f(x)$ in the interval $(-2, 4)$.



Critical Points

- 1 List each, if there are any, local maximum for $f(x)$ in the interval $(-2, 4)$.
- 2 List each, if there are any, global maximum for $f(x)$ in the interval $[-2, 4]$.



Derivatives

Suppose that f and g are differentiable function with the values shown in

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	2	-1	4
2	4	1	3	2
3	-1	4	2	-5
4	1	2	1	3

the following table.

- ① Find $h'(3)$ if $h(x) = f(x)g(x)$.

Derivatives

Suppose that f and g are differentiable function with the values shown in

the following table.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	2	-1	4
2	4	1	3	2
3	-1	4	2	-5
4	1	2	1	3

- 1 Find $h'(3)$ if $h(x) = f(x)g(x)$.
- 2 Find $h'(1)$ if $h(x) = f(g(x))$

Derivatives

Suppose that f and g are differentiable function with the values shown in

the following table.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	2	-1	4
2	4	1	3	2
3	-1	4	2	-5
4	1	2	1	3

- 1 Find $h'(3)$ if $h(x) = f(x)g(x)$.
- 2 Find $h'(1)$ if $h(x) = f(g(x))$
- 3 Find $h'(1)$ if $h(x) = 3f(x) - 5g(x) + 9$

Derivatives

Suppose that f and g are differentiable function with the values shown in

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	2	-1	4
2	4	1	3	2
3	-1	4	2	-5
4	1	2	1	3

the following table.

- 1 Find $h'(3)$ if $h(x) = f(x)g(x)$.
- 2 Find $h'(1)$ if $h(x) = f(g(x))$
- 3 Find $h'(1)$ if $h(x) = 3f(x) - 5g(x) + 9$
- 4 Find $h'(1)$ if $h(x) = \frac{f(x)-1}{2g(x)}$

Optimization

A manufacturer wants to design a box with a square base and no top using 108 square meters of material. What dimensions for the box will provide a maximum volume?

Parametric Curves

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

- a) Find $\frac{dy}{dx}$ as a function of t .

Parametric Curves

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

- a) Find $\frac{dy}{dx}$ as a function of t .
- b) Find the equation of the tangent line to the parametric curve at the point where $t = -1$.

Limits

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

a) $\lim_{x \rightarrow 3^-} \frac{x}{x-3}$

Limits

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

a) $\lim_{x \rightarrow 3^-} \frac{x}{x-3}$

b) $\lim_{x \rightarrow \infty} \frac{e^{-2x} + e^{3x}}{6e^{3x} + 4}$

Limits

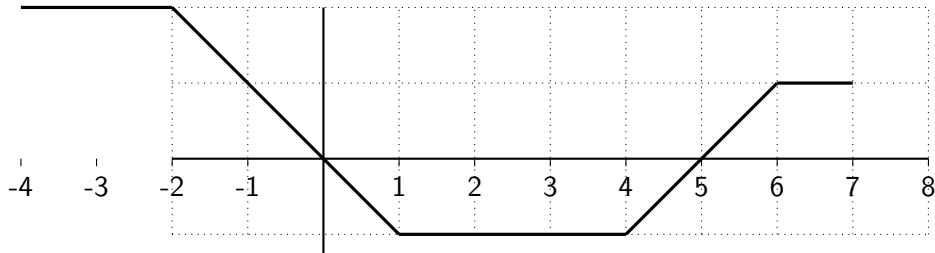
Evaluate the following limits. If a limit does not exist, explain why.

a) $\lim_{x \rightarrow 3^-} \frac{x}{x-3}$

b) $\lim_{x \rightarrow \infty} \frac{e^{-2x} + e^{3x}}{6e^{3x} + 4}$

c) $\lim_{x \rightarrow 0} \frac{\cos(3x) - 1}{x^2}$

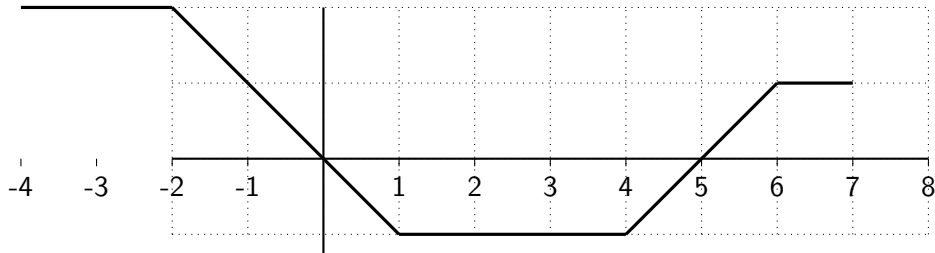
Integrals



Define the function F by $F(x) = \int_{-2}^x f(t) dt$.

- 1 Find the exact numerical value for $\int_{-4}^7 f(t) dt$.

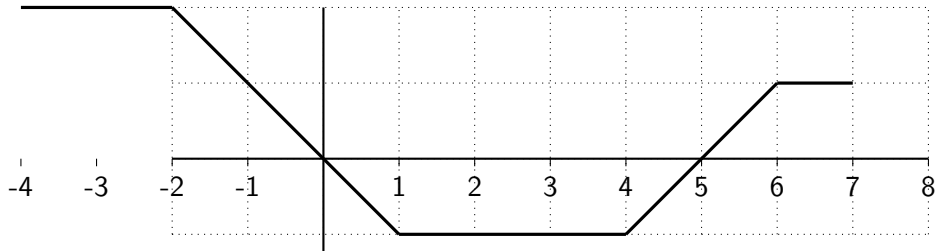
Integrals



Define the function F by $F(x) = \int_{-2}^x f(t)dt$.

- 1 Find the exact numerical value for $\int_{-4}^7 f(t)dt$.
- 2 Find the exact numerical value for $\int_{-4}^7 (3 - 2f(t))dt$.

Integrals



Define the function F by $F(x) = \int_{-2}^x f(t) dt$.

- ① Find the exact numerical value for $\int_{-4}^7 f(t) dt$.
- ② Find the exact numerical value for $\int_{-4}^7 (3 - 2f(t)) dt$.
- ③ Provide the exact value of $F'(-3)$.
- ④ At which value of x in $(-4, 7)$, if any, does the function $F(x)$ have a local maximum?

Integrals

1 Evaluate $\int \left(x^2 - \frac{1}{x} + 4e^x \right) dx$

Integrals

- 1 Evaluate $\int \left(x^2 - \frac{1}{x} + 4e^x \right) dx$
- 2 Evaluate $\int_1^4 2\sqrt{x} dx$

Integrals

- 1 Evaluate $\int \left(x^2 - \frac{1}{x} + 4e^x \right) dx$
- 2 Evaluate $\int_1^4 2\sqrt{x} dx$
- 3 Evaluate $\int x^2 \sin(x^3 - 6) dx$