Jeopardy Game

Precalculus	Functions	Limits	Derivative	Evaluation of derivatives	Theory
100	100	100	100	100	100
200	200	200	200	200	200
300	300	300	300	300	300
400	400	400	400	400	400

Player A

Precalculus for 100.

$\ln \dfrac{x}{y} =$

- a $\ln x + \ln y$
- b $\ln x - \ln y$
- c $x \ln y$
- d $y \ln x$
- e none of them

Precalculus for 200.

The function $y = x^2 \cdot \sin x$ is

- a odd
- b even
- c neither odd nor even

Precalculus for 300.

$\arctan 1 =$

- a ∞
- b $\dfrac{\pi}{3}$
- c $\dfrac{\pi}{4}$
- d $\dfrac{\pi}{6}$
- e none of them

Precalculus for 400.

The equivalence "$a < b$ if and only if $f(a) < f(b)$" is the property of

- a even functions
- b one-to-one functions
- c continuous functions
- d increasing functions
- e none of them

Functions for 100.

How many points of inflection is on the graph of the function $y = \sin x$ in the open interval $(0, 2\pi)$

- a none
- b one
- c two
- d three
- e none of them

Functions for 200.

Find points of discontinuity of the function $y = \dfrac{x-4}{(x-2)\ln x}$

- a none
- b 0
- c $0,\ 1$
- d $0,\ 1,\ 2$
- e $0,\ 2$
- f $0,\ 1,\ 4$
- g $0,\ 4$
- h none of them

Functions for 300.

Let f be a function and f^{-1} be its inverse. Then $f^{-1}\big(f(x)\big) =$

- a 0
- b 1
- c x
- d $f(x)$
- e $f^{-1}(x)$
- f none of them

Functions for 400.

$\arcsin(\sin x) = x$ for every $x \in \mathbf{R}$

- a Yes
- b No

Limits for 100.

$$\lim_{x \to -\infty} \operatorname{arctg} x =$$

- a 0
- b $\frac{\pi}{2}$
- c $-\frac{\pi}{2}$
- d ∞
- e $-\infty$
- f none of them

Limits for 200.

$$\lim_{x \to \infty} \sin x =$$

- a 1
- b -1
- c does not exist
- d none of them

Limits for 300.

$$\lim_{x\to\infty} \frac{2x^3 + x^2 + 4}{x^2 - x + 2} =$$

a ∞

b 2

c 0

d none of them

Limits for 400.

$$\lim_{x \to 0^+} \frac{e^{1/x}(x-1)}{x}$$

- a 0
- b 1
- c e
- d ∞
- e -1
- f $-e$
- g $-\infty$
- h none of them

Derivative for 100.

$$\left(\frac{1}{\sqrt[3]{x}}\right)' =$$

- a $\frac{1}{3}x^{-2/3}$
- b $-\frac{1}{3}x^{-2/3}$
- c $-\frac{1}{3}x^{1/3}$
- d $\frac{1}{3}x^{-4/3}$
- e $-\frac{1}{3}x^{-4/3}$
- f none of them

Derivative for 200.

$(x - x\ln x)' =$

- a $\ln x$
- b $-\ln x$
- c $1 + \ln x$
- d $1 - \ln x$
- e 0
- f $1 - \dfrac{1}{x}$
- g none of them

Derivative for 300.

$\left(x^2 e^{x^2}\right)'$

- a $2xe^{2x}$
- b $2xe^{x^2}2x$
- c $2xe^{x^2} + x^2 e^{x^2}$
- d $2xe^{x^2} + x^2 e^{x^2} 2x$
- e $2xe^{x^2}2x + x^2 e^{x^2} 2x$
- f none of them

Derivative for 400.

The definition of the derivative of the function f at the point a is

a $\lim_{h \to 0} \frac{f(x+h)+f(x)}{h}$

b $\lim_{h \to 0} \frac{f(x+h)}{h}$

c $\lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$

d $\lim_{h \to 0} \frac{f(x)-f(x+h)}{h}$

e $\lim_{h \to 0} \frac{f(x-h)-f(x)}{h}$

f none of them

Evaluation of derivatives for 100.

$(x^2 + 1)' = \boxed{}$

Evaluation of derivatives for 200.

$(xe^x)' = \boxed{}$

Evaluation of derivatives for 300.

$\ln(\sin x) =$ $\boxed{}$

Evaluation of derivatives for 400.

$(xe^{-x})' = \boxed{}$

Theory for 100.

By theorem of Bolzano, the polynomial $y = x^3 + 2x + 4$ has zero on

- a $(0, 1)$
- b $(1, 2)$
- c $(2, 3)$
- d $(-1, 0)$
- e $(-2, -1)$
- f $(-3, -2)$
- g none of them

Theory for 200.

Let $a \in Im(f)$. Then the solution of the equation $f(x) = a$ exists. This solution is unique if and only if

- a f is one-to-one
- b f is increasing
- c f continuous
- d f differentiable
- e none of them

Theory for 300.

If the function has a derivative at the point $x = a$, then it is

- a increasing at a.
- b decreasing at a.
- c one-to-one at a.
- d continuous at a.
- e undefined at a.

Theory for 400.

If both $y(a) = y'(a) = y''(a) = 0$, then the function

- a has local maximum at a.
- b has local minimum at a.
- c has point of inflection at a.
- d any of these possibilites may be true, we need more informations.