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Thursday Tutoring Session

2 messages

Hasina Mohammed <hasinazm@outlook.com>
To: jabar salih hassan <jabar.hassan@su.edu.krd>

Wed, Nov 29, 2023 at 1:49 PM

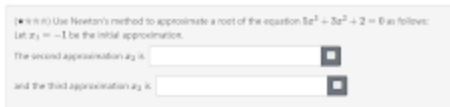
Hello Mr. Hassan,

I've attached some questions for this week that I don't quite understand. Apologies for sending them so late.

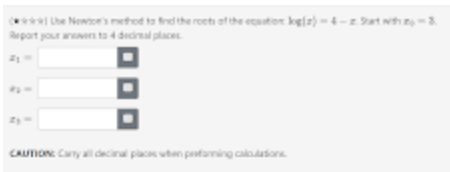
Also, what's your preferred method of payment?

Thank you,
Hasina

15 attachments



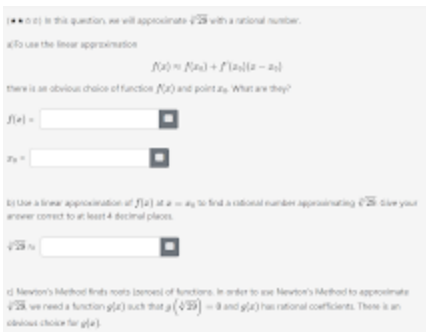
Screenshot 2023-11-29 133911.png
42K



Screenshot 2023-11-29 134027.png
49K



Screenshot 2023-11-29 134045.png
82K



Screenshot 2023-11-29 134238.png
127K

Newton's method finds roots (zeros) of functions. In order to use Newton's Method to approximate $\sqrt[4]{25}$, we need a function $g(x)$ such that $g(\sqrt[4]{25}) = 0$ and $g'(x)$ has rational coefficients. There is an obvious choice for $g(x)$.

For example to approximate $\sqrt[4]{25}$, the obvious choice is $g(x) = x^4 - 25$. To approximate $\sqrt[4]{125}$, the obvious choice is $g(x) = x^4 - 125$.

What is the obvious choice of $g(x)$ to approximate $\sqrt[4]{25}$?

$g(x) =$

Which integer x_0 makes $g'(x_0)$ as close as possible to 0?

$x_0 =$

Use two iterations of Newton's Method using $g(x)$ and x_0 found above to approximate $\sqrt[4]{25}$. Give your answers correct to at least 4 decimal places.

$x_1 =$

$x_2 =$

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Consider the concentration C of a drug in the blood as a function of x , the amount of the drug given, and t , the time since the injection. For $0 \leq x \leq 3$ and $t \geq 0$, we have

$$C = f(x, t) = ate^{-tx}$$

The units of C are milligrams per liter, the units of x are milligrams, and the units of t are hours.

Sketch the following two single-variable functions on a separate page. Pay attention to the domains given at the start of the problem.

(a) $f(1, t)$
(b) $f(x, 3.5)$

Using your graph in (a), where is $f(1, t)$...

a maximum? $t =$

a minimum? $t =$

Using your graph in (b), where is $f(x, 3.5)$...

a maximum? $x =$

a minimum? $x =$

Give a practical interpretation of the function $f(3, t)$. Choose the best answer.

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Give a practical interpretation of the function $f(1, t)$. Choose the best answer.

A. the time after injection until the concentration in the blood is 1 mg/L, as a function of the amount injected

B. the initial injection necessary for concentration to be 1 mg/L, as a function of time

C. the concentration of the drug in the blood 1 hour after injection, as a function of the amount injected

D. the time after injecting 1 mg, as a function of concentration

E. the concentration of the drug in the blood resulting from a 1 mg injection as a function of time

Give a practical interpretation of the function $f(x, 3.5)$. Choose the best answer.

A. the time after injecting 3.5 mg, as a function of concentration

B. the concentration of the drug in the blood 3.5 hours after injection, as a function of the amount injected

C. the concentration of the drug in the blood resulting from a 3.5 mg injection as a function of time

D. the time after injection until the concentration in the blood is 3.5 mg/L, as a function of the amount injected

E. the initial injection necessary for concentration to be 3.5 mg/L, as a function of time

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Suppose $f(x, y)$ is a differentiable function. Match the names of its derivatives in Newtonian and Leibniz notation.

1. $\frac{\partial^2 f}{\partial x^2}$	A. f_{xx}
2. $\frac{\partial^2 f}{\partial x \partial y}$	B. f_{xy}
3. $\frac{\partial f}{\partial x}$	C. f_{xy}
4. $\frac{\partial^2 f}{\partial y^2}$	D. f_x
5. $\frac{\partial f}{\partial y}$	E. f_y
6. $\frac{\partial f}{\partial x}$	F. f_{xx}

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(☆☆☆☆) Compute the partial derivative:

$$f(x, y) = \sin(x^2 - 7y)$$

$f_{xy}(0, \pi) =$

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23K

Let $z = \sqrt{4x + 5y}$. Then:

The rate of change in z at $(5, 1)$ as we change x but hold y fixed is and

The rate of change in z at $(5, 1)$ as we change y but hold x fixed is

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Find all the first and second order partial derivatives of $f(x, y) = -8 \sin(2x + y) - 3 \cos(x - y)$.

A. $\frac{\partial f}{\partial x} = f_x =$

B. $\frac{\partial f}{\partial y} = f_y =$

C. $\frac{\partial^2 f}{\partial x^2} = f_{xx} =$

D. $\frac{\partial^2 f}{\partial x \partial y} = f_{xy} =$

E. $\frac{\partial^2 f}{\partial y \partial x} = f_{yx} =$

F. $\frac{\partial^2 f}{\partial y^2} = f_{yy} =$

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(☆☆☆) Given $u(x, t) = \frac{1}{\sqrt{2}} e^{-\frac{x^2}{2t}}$, compute:

$u_{xx} =$

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16K

••• (i) A one-meter long bar is heated unevenly, with temperature in °C at a distance x meters from one end at time t given by

$$M(x, t) = 88e^{-0.1t} \sin(\pi x)$$

$0 \leq x \leq 1$. On a sheet of paper, sketch a graph of M against x for $t = 0$ and $t = 1$. Think about why your graphs make sense.

(ii) Calculate each of:

$M_x(0.2, 1) =$

$M_x(0.8, 1) =$

(Be sure that you can say in words what the partial integration (or sums of temperature) of these two partial derivatives is, and why each has the sign that it does.)

(iii) Calculate:

$M_t(x, 1) =$

(Again, be sure that you understand why it has the sign that it does, and what its interpretation in terms of temperature is.)

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••• (i) Consider the function

$$f(x, y) = \frac{2y^2 - 3x^2}{6}$$

Which graph below corresponds to the following traces:

- 1. The trace for $x = -0.5$
- 2. The trace for $y = 0.45$
- 3. The trace for $x = 1.35$
- 4. The trace for $y = -1.5$

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••• (i) Match each function with its graph.

- 1. $f(x, y) = 3 - x^2 - y^2$
- 2. $f(x, y) = \cos\left(\frac{\pi^2 x^2}{4}\right)$
- 3. $f(x, y) = 5 - \sqrt{x^2 + y^2}$
- 4. $f(x, y) = \frac{2}{(1 + x^2 + y^2)^2}$

(You can drag the images to make them.)

Screenshot 2023-11-29 134809.png
202K

jabar salih hassan <jabar.hassan@su.edu.krd>
To: Hasina Mohammed <hasinazm@outlook.com>

Wed, Nov 29, 2023 at 6:45 PM

Hi Hasina,
Thanks for your email. See you on time at 10:00 am via zoom meeting.

Jabar S. Hassan, PhD in Mathematics

Department of Mathematics - College of Science

Email: jabar.hassan@su.edu.krd

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