Exam #2 - REWRITE

Due November 29, 2018

Name (Print): _____

First Last

Instructions: You may speak to other classmates about your solutions, but you **may not copy other people's solutions**. You writing must be your own, and your answers must be thoroughly justified.

- *Multiple choice:*
  - If you got a problem correct, put an X in the answer box.
  - If you got a problem wrong, place the answer in the answer box, and **show your work**. You will be graded on both.

  Your **rewrite grade** will be as follows:

  7 points per problem you got right before; and

  your new grade (out of 7) on any problems you got wrong before.

  If you skip writing a problem you got wrong before, you'll get a 0 on that problem for your rewrite.
- *Short and long answers:* If you lost 0, 1, or 2 points on the entire problem, put a big X through the page. Otherwise, rewrite the **entire** problem (all parts). Your **rewrite grade** will be as follows:

  your old score on any problem you got almost full credit on before; and

  your new grade on any problems you rewrite.

  If you skip writing a problem you lost more than 2 points on before, you'll get a 0 on that problem for your rewrite.

Your **overall Exam 2 grade** will be the higher of (1) your original score and (2) the average of your old score and your rewrite score. **ATTACH YOUR ORIGINAL EXAM**.

Multiple choice:		
I	7	
II	7	
III	7	
IV	7	
V	7	
subtotal	35	

Short answer:		
1	15	
2	5	
Long answer:		
1	10	
2 (a)–(e)	10	
2 (f)–(h)	15	
2 (i)	10	
total	100	

Multiple choice

I. What is the derivative of $f(x) = \arcsin(x)$?

(a) $f'(x) = \arccos(x)$

(b) $f'(x) = \dfrac{1}{1+x^2}$

(c) $f'(x) = \dfrac{1}{\sqrt{1-x^2}}$

(d) $f'(x) = \dfrac{1}{\sqrt{1+x^2}}$

(e) None of these.

Answer:

II. What is the derivative of $f(x) = \ln(\cos(x))$?

(a) $f'(x) = \frac{1}{x}\cos(x) - \ln(\sin(x))$

(b) $f'(x) = -\dfrac{\sin(x)}{\cos(x)}$

(c) $f'(x) = \dfrac{\cos(x)}{\sin(x)}$

(d) $f'(x) = \dfrac{1}{\cos(x)}$

(e) None of these.

Answer:

III. If $y^2\cos(x) = 3$, what is $\frac{dy}{dx}$ (over all possible points on this curve)?

(a) $\dfrac{dy}{dx} = \dfrac{3\sec(x)\tan(x)}{2\sqrt{3\sec(x)}} = \dfrac{1}{2}\tan(x)\sqrt{3\sec(x)}$

(b) $\dfrac{dy}{dx} = -\dfrac{2\cos(x)}{\sin(x)}$

(c) $\dfrac{dy}{dx} = \dfrac{y^2\sin(x)}{2\cos(x)}$

(d) $\dfrac{dy}{dx} = \dfrac{y\sin(x)}{2\cos(x)}$

(e) None of these.

Answer:

IV. What is the derivative of $f(x) = x^2 5^x$?

(a) $f'(x) = (x^2\ln(5) + 2x)5^x$

(b) $f'(x) = 2x \cdot \ln(5)5^x$

(c) $f'(x) = 2x + \ln(5)5^x$

(d) $f'(x) = 2x5^x + x^2 \cdot x5^{x-1}$

(e) None of these.

Answer:

V. Which of these lines would be best to use to approximate $\sqrt{10}$?

(a) $L(x) = \dfrac{1}{2\sqrt{x}}(x-10) + \sqrt{x}$

(b) $L(x) = \dfrac{1}{2\sqrt{10}}(x-10) + \sqrt{10}$

(c) $L(x) = \dfrac{1}{2}(x-1) + 1$

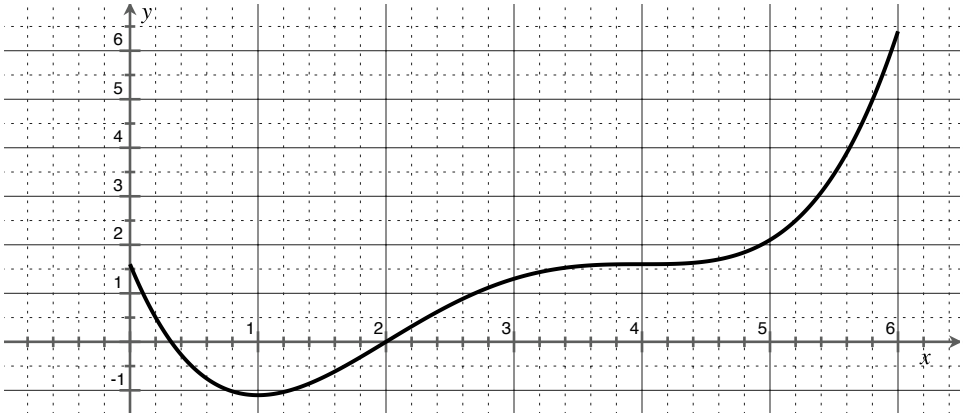
(d) $L(x) = \dfrac{1}{2*3}(x-9) + 3$

(e) None of these.

Answer:

Short answer questions

1. Below is a graph of $f(x)$ over the interval $[0, 6]$.
Answer each of the following about $f(x)$ over the interval $[0, 6]$.



(a) How many <u>critical points</u> does $f(x)$ have?
Mark their approximate location(s) on the graph with an ✕.

 # critical points: ☐

(b) How many <u>inflection points</u> does $f(x)$ have?
Mark their approximate location(s) on the graph with a circle, ○.

 # inflection points: ☐

(c) Approximately, over what interval(s) is $f(x)$ decreasing?

(d) Approximately, over what interval(s) is $f(x)$ negative?

(e) Approximately, over what interval(s) is the second derivative $f''(x)$ positive?

2. Pick **one of the following** and do it. **Check the box** next to the one you want graded.

Grade this one: ☐

Finish this statement of the mean value theorem:

Suppose $y = f(x)$ is continuous function over a closed interval $[a, b]$ and differentiable over the interval's interior (a, b). Then...

Grade this one: ☐

Finish this statement of the first derivative theorem/test:

If $f(x)$ is differentiable over its domain, and has a local maximum or minimum value at an interior point $x = c$ of its domain, then...

Grade this one: ☐

Finish this definition of linearization:

If $f(x)$ is differentiable at $x = a$, the linearization of $f(x)$ at $x = a$ is...

Long answer questions

1. When a circular plate of metal is heated in an oven, its radius increases at a rate of 3 mm per minute. At what rate is the plate's area increasing when the radius is 120 mm?

Be sure to **draw a picture**, clearly marking the diagram with the variables you use. Also, state the known quantities and the desired quantities (just from the problem statement) in the boxes given.

Known:	Wanted:

2. Let $f(x) = \dfrac{x^2 + 2x - 3}{x^2}$.

(a) What is the domain of $f(x)$?

(b) For what x is $f(x) = 0$?

(c) For what intervals is $f(x)$ positive or negative? (Ok to use a number line to answer, if you want.)

(d) Does $f(x)$ have any vertical asymptotes? If so, what are they?

(e) Does $f(x)$ have any horizontal asymptotes? If so what are they?
Either way, justify your answer.

$f(x) = \dfrac{x^2 + 2x - 3}{x^2}$ *continued...*

(f) Calculate $f'(x)$ and $f''(x)$, and place your answers in the boxes provided.

$f'(x) =$ $\qquad$ $f''(x) =$

(g) Over what intervals is $f(x)$ increasing? decreasing?

(Ok to use a number line to answer, if you want.)

(h) Over what intervals is $f(x)$ concave up? concave down?

(Ok to use a number line to answer, if you want.)

$f(x) = \frac{x^2+2x-3}{x^2}$ *continued...*

(i) Summarize the information about $f(x)$, $f'(x)$, and $f''(x)$ from the previous two pages on the number lines given, and then sketch $f(x)$ on the axes below. Be sure to **label the type and the x-value of any important points**, like intercepts, critical points, and inflection points.

$f(x)$:

$f'(x)$:

$f''(x)$: