Midterm Exam 08/11/2021

ⓘ This is a preview of the published version of the quiz

Started: Nov 8 at 8:22pm

Quiz Instructions

Functions to type in if needed:

sqrt(x): square root function; \infty: infinity

sin(x): sine function; -\infty: minus infinity

cos(x): cosine function; (a,b)U(c,d): union of intervals

e^(x): exponential function; \theta: angle theta

ln(x): logarihtmic function; \pi: the number pi

<=: less equal than; >=: greater equal than

Question 1 2 pts

Find the constant C of the antiderivative f, if $f'(x) = e^{x/3} + 20(1+x^2)^{-1}$ with $f(0) = 2$.

Question 2

3 pts

Use the Newton's approximation method to find the root (correct to 5 decimal places) of the equation $x^3 - 2x + 3 = 0$ with the initial $x = -2$.

Question 3

3 pts

Find the point on the parabola $y^2 = 2x$ that is closest to the point $A\left(1, \frac{27}{2}\right)$.

Hint: Type your answer in the form (x, y) of an ordered pair.

Question 4

4 pts

Suppose the function $g(x) = 200 + 8x^3 + x^4$. Give the first and second derivative in a simplified form.

Hint: Type in your answer in the form g'(x)=ax^b(A-x)(B-x)(C+x); g''(x)=ax^b(A-x)(B-x)(C+x)

Question 5

2 pts

Suppose the function $g(x) = 200 + 8x^3 + x^4$. Find the intervals of increase or decrease.

Hint: Type in your answer in the form decrease in (a,b); increase in (c,d)

Question 6

3 pts

Suppose the function $g(x) = 200 + 8x^3 + x^4$. Find the inflection points (IP) and the intervals of concavity.

Hint: Type in your answer in the form IP: x,y; concave up in (a,b); concave down in (c,d)

Question 7

2 pts

Suppose the function $g(x) = 200 + 8x^3 + x^4$. Find the local maximum and minimum values.

Hint: Type in your answer in the form maximum: (x,f(x)); minimum: (x,f(x)) or minimum: does not exist

Question 8

3 pts

An object with weight W is dragged along a horizontal plane by a force acting along a rope attached to the object. If the rope makes an angle with the plane, then the magnitude of the force is $F = \dfrac{\mu W}{\mu \sin(\theta) + \cos(\theta)}$, where \mu is a positive constant called the *coefficient of friction* and where $0 \leq \theta \leq \pi/2$. Determine the type of the critical point $\tan(\theta) = \mu$.

- ☐ $F'' = W\cos(\theta) > 0$, maximum
- ☐ $F'' = 0$, inflection point
- ☐ $F'' = W\sin(\theta) > 0$, minimum
- ☐ $F'' = W\sin(\theta) < 0$, minimum

Question 9

1 pts

If f is odd, then f' is even.

- ◯ True
- ◯ False

Question 10

1 pts

Find the limit $\lim_{u \to 2} \dfrac{\sqrt{4u+1}-3}{u-2}$.

Question 11

2 pts

Find y' if $x^3 + y^4 = 3xy$.

- $y' = \dfrac{3(x^2 - y)}{3x - 4y^3}$
- $y' = \dfrac{3(x^2 - y^2)}{3x - 4y^2}$
- $y' = \dfrac{2(x^2 + y)}{3x - 4y^3}$
- $y' = \dfrac{3(x^2 - 2y)}{3x - 2y^3}$

Question 12

2 pts

Find the tangent to $x^3 + y^4 = 3xy$ at the point $(3, 3)$.

- ○ $12y = -5x + 31$
- ○ $y = \frac{1}{11}x - \frac{38}{11}$
- ○ $11y = -2x + 39$
- ○ $2y = 11x - 39$

Question 13

2 pts

Find the limit $\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right)$

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