Exam #2

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

Started: Jun 7 at 11:18pm

Quiz Instructions

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The following is Exam #2. You will have until 3:15 pm to complete this exam. The due time for the exam may be extended, so please do not stress if you are not finished and 3:15 pm approaches.

Please complete this exam on separate paper or on a tablet. Clearly indicate the question number for each question. Please show all work and clearly indicate your answers. Remember, this exam is an opportunity for you to demonstrate what you know. Please work on this exam on your own. You are not allowed to use your textbook, collaborate, nor allowed to use any external websites for assistance. You may use a calculator on this exam. You are allowed to use your notes on this exam. Once you complete this exam, please submit a pdf of your exam to Canvas.

Once you complete the exam, please click on "Submit". You will not submit the exam to this assignment. You will submit your exam through the "**Exam #2 Submission Assignment**" in Canvas under **Assignments**. You can use a device to scan your exam. Please note that once your click Submit on this part of the exam and use your phone, you may not continue to work on your exam. If using paper, scan in your exam using Adobe Scan or any other scanning app.

You may only submit your exam once through the submission assignment. Submission times may be checked with when you log off Zoom and/or when you submit this part of the exam.

For this exam, you must keep your camera on for proctoring purposes. You will be placed into an individual breakout room. If you have any questions during the exam, you can click on the "Ask for Help" button and I will be with you as soon as possible.

(6 points) 1. Find the length of the curve traced by $\vec{r}(t) = \left\langle 2t, t^2, \frac{1}{3}t^3 \right\rangle$ on $0 \leq t \leq 1$.

▶

(4 points) 2. Given $\vec{r}(t) = \left\langle t, t^2, t^3 \right\rangle$. Find the curvature, κ, at the point $(1, 1, 1)$.

3. Given the position vector and point: $\vec{r}(t) = \langle \cos t, \sin t, \ln \cos t \rangle$, $P_0\ (1, 0, 0)$

(4 points) a. Find the unit normal vector, $\hat{N}(t)$, at P_0.

(4 points) b. Find the the binormal vector, $\hat{B}(t)$, at P_0.

(3 points) 4. Given the acceleration vector
$\vec{a}(t) = (4t + 2)\hat{\imath} + (5t)\hat{\jmath} + (3t^2 - 1)\hat{k}$. Find the position vector, $\hat{r}(t)$, given
$\vec{r}(0) = 3\hat{\imath} + 5\hat{k}$ and $\vec{v}(0) = 4\hat{\imath} + 3\hat{\jmath} - 2\hat{k}$.

5. Given that the position vector $\vec{r}(t) = (80\sqrt{3})t\hat{\imath} + (96 + 80t - 16t^2)\hat{\jmath}$ describes the motion of a projectile, where distance is measured in feet and time is measured in seconds.

(3 points) a. When does the projectile attain its maximum height?

(2 points) b. What is the maximum height that the projectile attains?

(3 points) c. When does the projectile hit the ground?

(2 points) d. What is the range of the projectile? (That is, what is the horizontal distance that the projectile travels?)

(4 points) 6. For the following function, determine and sketch the domain:

$f(x, y) = \frac{\sqrt{x-y+1}}{x-3}$

(4 points) 7. Given $f(x, y) = x^2 + y$. Sketch the function's level curves for $k = 0, 2, \text{and } 3$.

(4 points) 8. Find the following limit: $\lim_{(x,y)\to(0,0)} \frac{x^4-16y^4}{x^2-4y^2}$

(4 points) 9. Show that $\lim_{(x,y)\to(0,0)} \frac{2x^2-y^2}{x^2+y^2}$ does not exist by using the two-paths approach.

10. Given $f(x, y) = y^2 \sin(xy)$.

(2 points) a. Find f_x

(2 points) b. Find f_y

(3 points) c. Find f_{xx}

(3 points) d. Find f_{xy}

(3 points) e. Find f_{yy}

(4 points) 11. Given
$w = 4x^2y^3 + 2z^4,\ x = 5s^3 + 7t^2,\ y = 8s^4 + 7t^3,\ z = 3s^5 - 6t^4$. Find $\frac{\partial w}{\partial s}$ and $\frac{\partial w}{\partial t}$.

(4 points) 12. Use partial derivatives to perform implicit differentiation to find $\frac{dy}{dx}$ if $4x^3 + 6x^4y^5 = 3\sin\left(x^2y^3\right) + 5y^4$, where y is a differentiable function of x.

13. Given $f(x, y) = x^3e^{xy}$.

(4 points) a. Find the linearization, $L(x, y)$, of the function at $(1, 0)$.

(2 points) b. Use the linearization to approximate the function at the point $(1.3, 0.2)$.

(4 points) 14. Find the directional derivative of
$f(x, y, z) = \cos(xy)\hat{\imath} + e^{yz}\hat{\jmath} + \ln(zx)\hat{k}$ at the point $\left(1, 0, \frac{1}{2}\right)$ in the direction of the vector $\vec{u} = \hat{\imath} + 2\hat{\jmath} + 2\hat{k}$.

15. Given $x^2 + 2xy - y^2 + z^2 = 7$ and the point $P_0(1, -1, 3)$.

(4 points) a. Find the equation of the tangent plane at the point P_0.

(2 points) b. Find the equation of the normal line to the given surface at the point P_0.

16. Given $f(x,y) = ye^{xy}$ and the point $P_0(0,2)$

(2 points) a. Find the direction of most rapid increase at P_0.

(2 points) b. Find the direction of most rapid decrease at P_0.

(2 points) c. Find the directions of zero change at P_0.

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