

NAME _____

STUDENT ID _____

RECITATION INSTRUCTOR _____

RECITATION TIME _____

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DIRECTIONS

1. Write your name, 10-digit PUID, recitation instructor's name and recitation time in the space provided above. Also write your name at the top of pages 2, 3 and 4.
2. The test has four (4) pages, including this one.
3. Write your answers in the boxes provided.
4. You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
5. Credit for each problem is given in parentheses in the left hand margin.
6. No books, notes, calculators or any electronic devices may be used on this exam.

- (6) 1. Find the domain of the function $h(x) = \frac{1}{\sqrt[4]{x^2 - 5x}}$.

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- (8) 2. If $f(x) = 1 - 3x$ and $g(x) = \cos x$, find the following

$(f \circ g)(x) =$

$(g \circ f)(x) =$

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$(g \circ g)(x) =$

(6) 3. Find all values of x in the interval $[0, 2\pi]$ that satisfy the equation $\cos x + \sin 2x = 0$.

(6) 4. If $f(x) = \ln(x + 3)$ find a formula for the inverse function $f^{-1}(x)$.

$f^{-1}(x) =$

(4) 5. Solve each equation for x .

(a) $2 \ln x = 1$

$x =$

(b) $e^{-x} = 5$

$x =$

(6) 6. If $f(x) = \begin{cases} \frac{x^2 - x}{x^2 - 1} & \text{if } x \neq 1 \\ 1 & \text{if } x = 1 \end{cases}$ explain why f is discontinuous at $a = 1$.

(6) 7. Find the exact numerical value of the following:

(a) $\log_{49} e^{4 \ln 7}$

(b) $\ln(\log_2 2008 - \log_2 1004)$

(c) $\sin(\ln \sqrt{e^\pi})$

- (10) 8. For each of the following, fill in the boxes below with a finite number or one of the symbols $+\infty$, $-\infty$, or DNE (does not exist). It is not necessary to give reasons for your answers.

(a) $\lim_{x \rightarrow \pi^-} \cot x =$

(b) $\lim_{x \rightarrow 0^-} \frac{x}{|\sin x|} =$

(c) $\lim_{r \rightarrow 9} \frac{\sqrt{r}}{(r-9)^2} =$

(d) $\lim_{x \rightarrow \infty} \cos x =$

(e) $\lim_{x \rightarrow 3^+} \frac{2|x-3|}{x-3} =$

- (6) 9. Find the equations of the vertical and horizontal asymptotes of the graph of $y = \frac{5x^2 - 2x + 1}{x^2 - x - 2}$.

Vertical asymptotes

Horizontal asymptotes

- (8) 10. Show that there is a root of the equation $x^2 - x - 1 = \frac{1}{x+1}$ in the interval $(1, 2)$. State the name of the theorem you are using.

- (10) 11. Find the derivative of the function $g(t) = \sqrt{t}$ using the definition of the derivative $g'(t) = \lim_{h \rightarrow 0} \frac{g(t+h) - g(t)}{h}$. (0 credit for using a formula for the derivative).

- (8) 12. Find an equation of the tangent line to the curve $y = x\sqrt{x}$ that is parallel to the line $y = 1 + 3x$

- (16) 13. Find the derivatives of the following functions. Do not simplify.

(a) $g(t) = 4\sec t + \tan t$.

(b) $y = e^x(1 + \cot x)$.

(c) $f(x) = \frac{xe^x}{\sin x}$.

(d) $u = \sqrt[5]{t} + 4\sqrt{t^5}$.