

MATH 125
SPRING 2022
EXAM 3

NAME:

1. 10 pts. each Let $f(x) = \frac{x}{1-2x}$ and $g(x) = \frac{2}{\sqrt{x}}$.

 - (a) Find $(f \circ g)(x)$ and $(g \circ f)(x)$. Do not simplify.
 - (b) Find the domain of $f \circ g$, using the appropriate definition.
 - (c) Find the domain of $g \circ f$, using the appropriate definition.
2. 10 pts. If $f(x) = 3x^2 - 7$ and $g(x) = 2x + c$, find the value of c so that the graph of $f \circ g$ crosses the y -axis at -20 .
3. 10 pts. each Let $T(x) = \frac{2x-3}{x+4}$, which is one-to-one.

 - (a) Find T^{-1} .
 - (b) Find the domain and range of T and T^{-1} .
4. 10 pts. each Solve each equation in exact form. The change-of-base formula may be necessary.

 - (a) $5^{x+3} = \frac{1}{25}$
 - (b) $\log_x\left(\frac{1}{8}\right) = 3$
 - (c) $2\log_3(x+4) - \log_3 9 = 2$
 - (d) $\log_5(x+3) = 1 - \log_5(x-1)$
 - (e) $9^x - 3^{x+1} + 1 = 0$
 - (f) $\log_2 x + \log_4 x + \log_8 x = 11$
5. 10 pts. each Let $v(x) = 8 - \log_6(2x+1)$, which is one-to-one.

 - (a) Find v^{-1} .
 - (b) Find the domain and range of v and v^{-1} .
6. 5 pts. each The number N of bacteria present in a culture at time t (in hours) obeys the model $N(t) = 1000e^{0.01t}$. Label your answers with the correct units. Round answers to the nearest tenth (one decimal place). Show your work.

 - (a) Determine the initial number of bacteria.
 - (b) What is the population after 4 hours?
 - (c) When will the number of bacteria reach 1600?
7. 10 pts. Convert 44.444° to degree-minute-second format, rounding to the nearest second. Show work.

8. 10 pts. The terminal side of the angle φ contains the point $(1, -3)$. Find the exact value of each of the six trigonometric functions of φ .
9. 10 pts. Find two negative and three positive angles, expressed in radians, whose terminal side contains the point $(\frac{1}{2}, \frac{\sqrt{3}}{2})$ on the unit circle.