

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) $6^{2x+3} = \frac{1}{216}$
 - (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 $\omega(x) = 3 - 2\log_8(8-x)$, which is one-to-one.

 - (a) Find ω^{-1} .
 - (b) Find the domain and range of ω and ω^{-1} .
6. 15 pts. At 45°C , dinitrogen pentoxide (N_2O_5) decomposes into nitrous oxide (NO_2) and oxygen (O_2) according to the law of uninhibited decay. An initial amount of 0.25 mole of dinitrogen pentoxide decomposes to 0.15 mole in 17 minutes. How much dinitrogen pentoxide will remain after 30 minutes? How long will it take until 0.02 mole of dinitrogen pentoxide remains?
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 $(-3, 4)$. 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 $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ on the unit circle.