Practice Problems for Math Success

Composition Functions

These **practice problems** are designed to help you **prepare for our course exams** and **assess your understanding** of the course material at the expected level. Aim to complete them **in class, during tutoring, office hours, or on your own**, and try to solve them **without notes or a calculator**, just like on the **actual exams**. Remember, **practice makes perfect**, so don't hesitate to **ask for help** if you get stuck.

1. Let $m(x) = \dfrac{1}{x-1}$ and $n(x) = \dfrac{2x^2}{x+1}$. Find a formula for each of the functions below. Simplify your final answer.

   (a) $m(n(x))$

   (b) $n(n(x))$

2. Let $f(x) = \dfrac{x^2}{x^2 - 5}$. Find and simplify $m(x)$ given that $f(m(x)) = \dfrac{x+2}{x-3}$.

3. Let H be a piecewise function given by

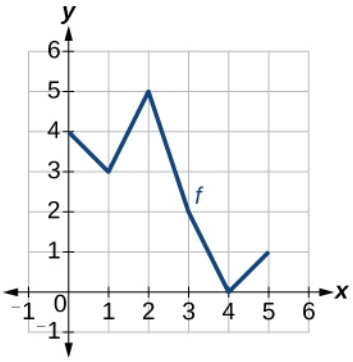
$$H(x) = \begin{cases} 3^x - 2, & x \leq 1 \\ -2x + 3, & 1 < x \leq 3 \\ x - 7, & 3 < x \leq 6 \end{cases}.$$

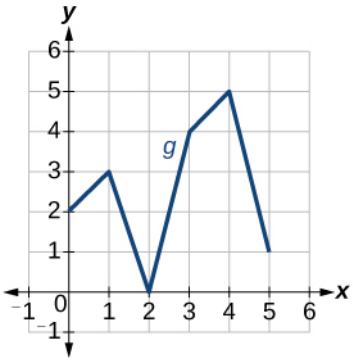
Fill in the blanks.

(a) $H(H(3)) =$ _____.

(b) $H(H(10)) =$ _____.

(c) $H(H(2)) =$ _____.





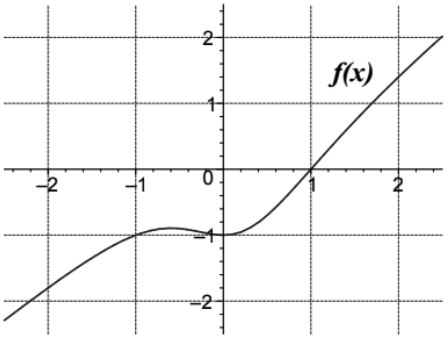
4. Consider the graphs of f and g above. Find in the blanks below.

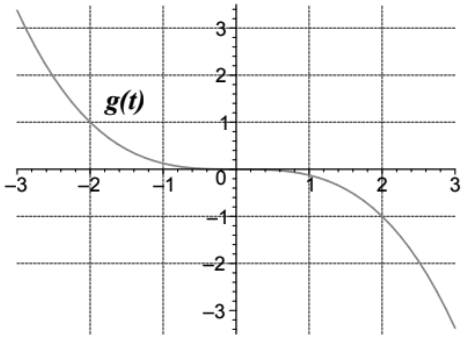
(a) $f(g(3)) =$ _____

(b) $g(f(0)) =$ _____

(c) $g(f(g(2))) =$ _____

5. Let f and g be two functions whose graphs are drawn below.





(a) Solve for t.

$$f(g(t)) \cdot g(t) = 0.$$

(b) For what values of t is $f(g(t)) > 0$? Express your answer in interval notation.