Math 1 Practice Problems I

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1. Let $h(t) = t + \dfrac{1}{t}$. Find $h(1), h(-1), h(2), h(\frac{1}{2}), h(x), h(\frac{1}{x})$.

2. Evaluate $f(-5), f(0), f(1), f(2), f(5)$ where $f(x) = \begin{cases} 3x, & x < 0 \\ x+1, & 0 \le x \le 2 \\ (x-2)^2, & x > 2 \end{cases}$.

3. Sketch the graph and find the domain and range for each of the following functions:

   (a) $f(x) = \begin{cases} 1, & x \le 1 \\ x+1, & x > 1 \end{cases}$

   (b) $f(x) = \begin{cases} 2x+3, & x < -1 \\ 3-x, & x \ge -1 \end{cases}$

   (c) $g(t) = \begin{cases} -t, & t < 0 \\ t^2, & 0 \le t < 2 \\ 1, & t \ge 2 \end{cases}$

4. Find the domain of the following functions:

   (a) $f(x) = \sqrt[3]{x^{10} - 11}$

   (b) $f(x) = \dfrac{1}{x} + \dfrac{1}{x+1} + \dfrac{1}{x+\pi}$

   (c) $h(t) = \sqrt[4]{9 - t^2}$

   (d) $g(x) = \dfrac{x}{\sqrt{x+1}}$

   (e) $f(x) = \dfrac{\sqrt[3]{2x+1}}{\sqrt[3]{2x}+2}$

   (f) $g(u) = \dfrac{2u^2 + 5u + 3}{2u^2 - 5u - 3}$

   (g) $F(x) = \sqrt{4-x} + \sqrt{x^2 - 1}$

5. Find the average rate of change of the function $f(x) = \dfrac{1}{x}$ on the following intervals:

   (a) $[3, 5]$

   (b) $[2, 2+h]$

6. Find $f(f(x)), f(g(x)), g(f(x)), g(g(x))$ where $f(x) = \dfrac{1}{x}$, $g(x) = 2x + 4$.

7. Find $f \circ g \circ h$ where $f(x) = \sqrt{1-x}, g(x) = 1 - x^2, h(x) = 1 + \sqrt{x}$.

8. Suppose the graph of f is given. Describe how the following functions transform the graph of f:

   (a) $f(\frac{1}{4}x)$
   (b) $-f(2x)$
   (c) $f(x-4) + \frac{3}{4}$

9. Sketch the graphs of the following functions:

   (a) $f(x) = 3|x| - 1$
   (b) $f(x) = (x-1)^3$
   (c) $f(x) = (x+3)^2 + 5$
   (d) $f(x) = 2 + \sqrt{-x+1}$
   (e) $f(x) = \dfrac{-2}{x+2}$

10. For each of the following, determine if f is even, odd, or neither:

    (a) $f(x) = x^5 + x^{-3}$
    (b) $f(x) = 1 - x^4$
    (c) $f(x) = 2x^5 - 3x^2 + 2$
    (d) $f(x) = \dfrac{1}{x+2}$

11. If $f(x) = \dfrac{1}{x-1}$ and $g(x) = \dfrac{1}{x} + 1$, verify f and g are inverses of each other. (Don't calculate the inverse directly.)

12. Find the inverse of the following functions:

    (a) $f(x) = \sqrt{2x-1}$
    (b) $g(x) = \dfrac{1}{x+2}$