• No calculators are allowed.

1. (2 points) Given that $f(x) = \frac{1}{1-x}$ and $g(x) = \frac{1}{x}$, find a simplified formula for $(g \circ f)(x)$ and state its domain.

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

$\circ = g\left(\frac{1}{1-x}\right), \ x \neq 1$

$\circ = \frac{1}{\left(\frac{1}{1-x}\right)}, \ x \neq 1$

$(g \circ f)(x) = 1-x, \ x \neq 1$

2. (2 points) Find the natural domain of $f(x) = \sqrt{9-x^2}$.

$9-x^2 \geq 0$

$x^2 \leq 9$

$|x| \leq 3$

$-3 \leq x \leq 3$

**Domain:** $[-3, 3]$

3. (2 points) Solve for $x$ in the equation below.

$11 = 3e^{2x} - 4$

$15 = 3e^{2x}$

$5 = e^{2x}$

$ln 5 = ln(e^{2x})$

$ln 5 = 2x$

$x = \frac{ln 5}{2}$
4. (2 points) Express the following function in piecewise form without using absolute values. Be sure to simplify each piece.

\[ f(x) = |x - 2| + 5x + 2 \]

\[ f(x) = \begin{cases} - (x-2) + 5x + 2, & x < 2 \\ (x-2) + 5x + 2, & x \geq 2 \end{cases} \]

\[ f(x) = \begin{cases} 4x + 4, & x < 2 \\ 6x, & x \geq 2 \end{cases} \]

5. (2 points) Sketch the graph of \( y = \ln(x - 3) + 2 \). Be sure to show any asymptotes as well as the coordinates for at least one point.