

**Question 1:**

(a)[4 points] Let  $f(x) = \sqrt{x-2}$  and  $g(x) = 1 - 2x$ . Determine and simplify  $f \circ g$ . State the domain.

(b)[4 points] Again let  $f(x) = \sqrt{x-2}$  and  $g(x) = 1 - 2x$ . Determine and simplify  $g \circ f$ . State the domain.

(c)[2 points] Let  $H(x) = \frac{\sqrt{x+1}}{2}$  and  $g(x) = x + 1$ . Determine the function  $f$  so that  $H(x) = (f \circ g)(x)$ .

**Question 2:**

(a)[5 points] Let  $f(x) = \frac{2x - 3}{x + 4}$ . Determine  $f^{-1}(x)$ .

(b)[3 points] Use part (a) to determine the domain and range of  $f(x) = \frac{2x - 3}{x + 4}$ .

(c)[2 points] If  $(3, -7)$  and  $(5, 3)$  are points on the graph of a function  $g(x)$ , calculate the value of  $g^{-1}(3) - g(3)$ .

**Question 3:**

(a)[5 points] Neatly sketch the graph of  $f(x) = 2^{x-2} - 1$ . Indicate at least one point on your graph.

(b)[5 points] Solve for  $x$ :

$$2^{x^2+7x} = 4^{x+7}$$

**Question 4:**

(a)[2 points] Compute a decimal approximation to  $\log_7 19$ . (Round your final answer to 3 decimal places.)

(b)[4 points] Express the following as sums and/or differences of logarithms. Where possible express powers as factors:

$$\ln \left[ \frac{(x-4)^2}{x^2-1} \right]^{2/3}$$

(c)[4 points] Write as a single logarithm:

$$8 \log_2 \sqrt{3x-2} - \log_2 \left( \frac{4}{x} \right) + \log_2 4$$

**Question 5:**

(a)[5 points] Solve the following logarithmic equation for  $x$ :

$$\log_6(x + 4) + \log_6(x + 3) = 1$$

(b)[5 points] A certain population grows according to the model  $P(t) = 500e^{kt}$  where  $t$  represents time in days and  $t = 0$  corresponds to the present. If the population doubles in five days, how long will it take to grow from 500 to 2500 individuals? Round your answer to the nearest day.