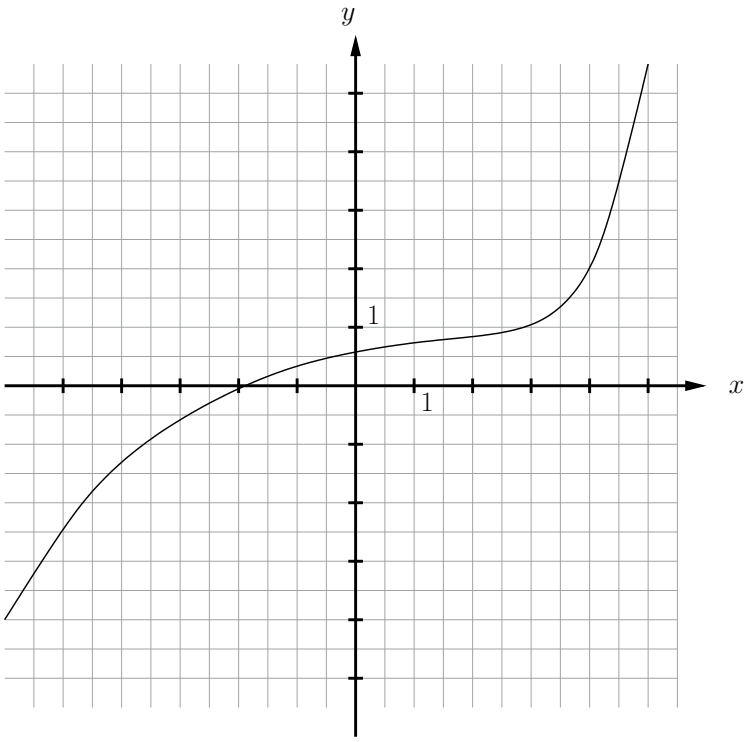
Question 1:

(a)[5 points] Let $f(x) = 1 - 3x^2$ and $g(x) = \sqrt{4 - x}$. Find $(f \circ g)(x)$ and state the domain.

(b)[5 points] Given below is the graph of $y = f(x)$. On the same set of axes carefully sketch the graph of $y = f^{-1}(x)$.



Question 2:

(a)[7 points] Let $f(x) = \dfrac{3x-5}{7x+2}$. Note that f is one-to-one. Find a formula for the inverse $f^{-1}(x)$.

(b)[3 points] Use your result in part (a) to determine the domain and range of f.

Question 3:

(a)[7 points] Solve $e^{x^2} = e^{3x} \cdot \dfrac{1}{e^2}$.

(b)[3 points] Calculate $\log_{\sqrt{5}}(2\pi)$ and round your final answer to three decimal places.

Question 4:

(a)[7 points] Solve $\log_2(x+3) = 3 - \log_2(x-4)$.

(b)[3 points] Write as a single simplified logarithm: $\frac{1}{2}\ln(x+7) - \ln(4x^3) + 5\ln(2x)$.

Question 5: An isolated population of a particular insect grows according to the population growth function

$$P(t) = P_0 e^{kt} \ ,$$

where $P(t)$ is the population at time t, P_0 is the initial population, k is the population growth rate, and t is time in days.

(a)[3 points] If the population doubles in 10 days, what is the value of k? (Round to 4 decimals.)

(b)[4 points] If the initial population is 500 individuals, how long does it take the population to reach a size of 5100? (Round to the nearest day.)

(c)[3 points] Again, if the initial population is 500 individuals, how many days does it take for the population to increase from 700 to 1900 indiviuals? (Round to the nearest day.)