Math 125 Quiz #3 (Fall 2020)

1 Find the domain, range, and horizontal asymptote for $f(x) = 3 - 6^{x-3}$.

We have Dom $f = (-\infty, \infty)$, Ran $f = (-\infty, 3)$, and horizontal asymptote $y = 3$.

2 Solve $9^{2x} \cdot 27^{x^2} = 3^{-1}$.

Write as $(3^2)^{2x} \cdot (3^3)^{x^2} = 3^{-1}$, and so $3^{3x^2+4x} = 3^{-1}$, implying $3x^2 + 4x = -1$. Now we get $3x^2 + 4x + 1 = 0$, which factors as $(3x + 1)(x + 1) = 0$. Solution set is $\{-1, -\frac{1}{3}\}$.

3 If $2^{-3x} = \dfrac{1}{1000}$, what does 2^x equal?

We have

$$2^{-3x} = \frac{1}{1000} \quad \Rightarrow \quad 2^{3x} = 1000 \quad \Rightarrow \quad (2^x)^3 = 10^3 \quad \Rightarrow \quad 2^x = 10,$$

taking the cube root of both sides.

4 Find domain of $g(x) = 7 - 2\ln(3 - 9x)$.

We must have

$$\text{Dom}\, g = \{x : 3 - 9x > 0\} = \{x : x < \tfrac{1}{3}\} = (-\infty, -\tfrac{1}{3}).$$