MATH 125 EXAM #3 KEY (SPRING 2019)

1 Domain is $(-\infty, \infty)$ and range is $(-\infty, 2)$.

2 Equation becomes $e^{x^2+4x} = e^{12}$, and so $x^2 + 4x = 12$. This solves to give solution set $\{-6, 2\}$.

3 Domain is

$$\left\{x : \frac{3}{2x-3} > 0\right\} = \{x : x > 3/2\} = (3/2, \infty).$$

4 We have $e^{-0.3x} = 9/2$, giving $-0.3x = \ln(9/2)$, and hence $x = -\frac{10}{3} \ln \frac{9}{2}$.

5 Find h such that $400 = 760e^{-0.145h}$, which implies $-0.145h = \ln(400/760)$, and hence

$$h = -\frac{1}{0.145} \ln\left(\frac{10}{19}\right) \approx 4.43 \text{ km}.$$

6 With laws of logarithms:

$$\log_2 \frac{(x-3)^3}{(2x-1)(x+1)}$$

7a We have

$$\log_6(x+4)(x+3) = 1 \quad \Rightarrow \quad (x+4)(x+3) = 6 \quad \Rightarrow \quad x = -6, -1.$$

The value -6 is an extraneous solution, and so the solution set is $\{-1\}$.

7b Taking logarithms of both sides:

$$x \ln(3/5) = (1-x) \ln 7 \quad \Rightarrow \quad x = \frac{\ln 7}{\ln(3/5) + \ln 7} = \frac{\ln 7}{\ln(21/5)}.$$

8a $A(11) = 100e^{-0.087(11)} \approx 38.4$ g.

8b Find t for which $A(t) = \frac{1}{2}A_0$:

$$\frac{1}{2}A_0 = A_0 e^{-0.087t} \quad \Rightarrow \quad e^{-0.087t} = \frac{1}{2} \quad \Rightarrow \quad -0.087t = \ln(1/2) \quad \Rightarrow \quad t \approx 7.97 \text{ days}.$$

Note that the value of A_0 is irrelevant.

9 $140°32'49''$.

10 $\sin\theta = -\frac{12}{13}$, $\cos\theta = \frac{5}{13}$, $\tan\theta = -\frac{12}{5}$, $\csc\theta = -\frac{13}{12}$, $\sec\theta = \frac{13}{5}$, $\cot\theta = -\frac{5}{12}$.

11 $\cos\theta = -\frac{\sqrt{5}}{3}$, $\tan\theta = \frac{2}{\sqrt{5}}$, $\csc\theta = -\frac{3}{2}$, $\sec\theta = -\frac{3}{\sqrt{5}}$, $\cot\theta = \frac{\sqrt{5}}{2}$.

12 Domain is $(-\infty, \infty)$, and range is $[-3, 5]$.

13 Domain is

$$\left\{x : \frac{3\pi}{2}x \neq \frac{\pi}{2} + k\pi\right\} = \left\{x : x \neq \frac{2k+1}{3}\right\},$$

where k is any integer. Range $(-\infty, -3] \cup [3, \infty)$.

14 $y = 6\sin(10x)$.