MATH 141:502 – Solution to Quiz 1 5 September 2019

Name and NetID:

Question 1. Let the linear function $D(t)$ denote the distance traveled of an eighteen wheeler through Interstate 10 after t hours of travel. Assuming that $D(0) = 3km$ and $D(6) = 30km$, determine the distance traveled after four hours. *[4]*

Solution. Since $D(t)$ is a linear function, there are constants $m, b \in \mathbb{R}$ such that:

$$D(t) = mt + b.$$

Then using $D(0) = 3$ and $D(6) = 30$ we find:

$$\begin{aligned} 3 = D(0) = m0 + b \quad &\text{so} \quad b = 3 \\ 30 = D(6) = m6 + 3 \quad &\text{so} \quad m = 9/2 \end{aligned}$$

so we find $D(t) = (9/2)t + 3$ meaning $\boxed{D(4) = (9/2)4 + 3 = 21km}$.

Question 2. A vertical line passes through the point $(3, 4)$ and a horizontal line passes through the point $(2, 1)$. Determine at which point the two lines cross. *[2]*

Solution. The vertical line has equation $x = 3$, while the horizontal line has equation $y = 1$. The intersection of these two lines is the point $\boxed{(3, 1)}$.

Question 3. The stock value, $B_1(t)$ and $B_2(t)$, of two banks after after t years of operation is given by the linear functions:

$$8B_1(t) - 5t + 2 = 0 \quad \text{and} \quad 3B_2(t) - 6t - 4 = 0.$$

Determine how many years it takes until the stock values are equal. *[4]*

Solution. We first solve for $B_1(t)$ on the first equation, obtaining:

$$B_1(t) = \frac{5}{8}t - \frac{1}{4}$$

we then solve for $B_2(t)$ on the second equation, obtaining:

$$B_1(t) = 2t + \frac{4}{3}.$$

To determine how many years t it takes for both stock values to be equal, we impose $B_1(t) = B_2(t)$:

$$\frac{5}{8}t - \frac{1}{4} = B_1(t) = B_2(t) = 2t + \frac{4}{3} \quad \text{so} \quad t = -\frac{38}{33} \text{ years.}$$

However time cannot be negative, so $\boxed{\text{stock values will never be equal}}$.