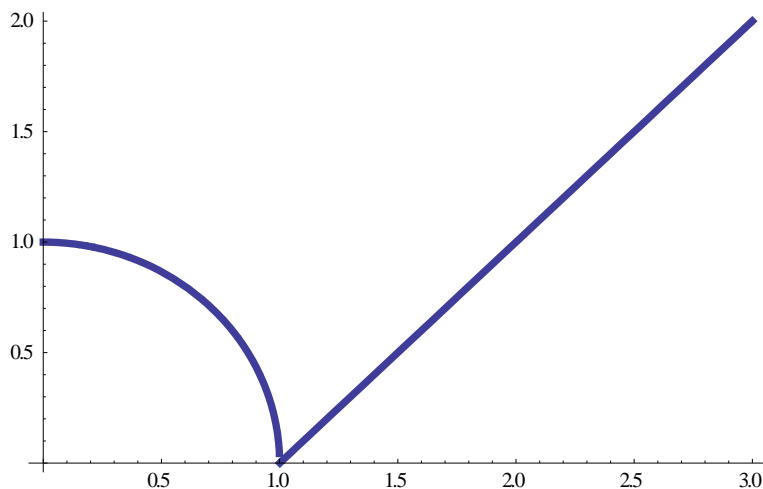


CLASS DISCUSSION I (28 AUG 2017)

Precalculus exercises

1. Let $G(x)$ be a function with domain $[0, 3]$ and range $[0, 2]$. The graph of G is displayed below.



Let $A(x) = G(x - 5)$; $B(x) = G(2x)$; $C(x) = 3G(3x) + 1$; and $R(x) = -3G(-x/2)$.

For each of the four functions, A , B , C , R , answer the following three questions.

- Find the *domain* of this function.
- Find the *range* of this function.
- Sketch the graph of this function. Be sure to indicate the x and y scales on your graph!

2. Albertine has inherited a cabin and a huge forest in southeastern Australia. She learns from her environmentalist friends that there are 1400 wombats remaining in her woods and 300 dingos, a natural predator of the wombat. Albertine is distressed to learn that the wombat population is declining by 1.3% per month while the dingo population is growing by 2.4% per month. *When* will the dingo population be *twice* that of the wombat population?



3. The Fifth-Thirty-Second Bank of GammaVille offers 4.1% interest per year *compounded weekly*. How much should Albertine deposit in such a savings account in order for her to have a balance of \$ 75,000 after twenty years?



4. The number of hemlock trees in the southern Appalachian Mountains is declining as a result of an infestation of hemlock woolly adelgids (a kind of insect).

- There are $H(d)$ *healthy* hemlock trees in the southern Appalachian Mountains d days after January 1, 2017.
- There are $I(d)$ infested hemlock trees in the southern Appalachian Mountains d days after January 1, 2017.

Note that all hemlock trees are considered healthy unless they are infested.

- Let $J(w)$ be the number of *healthy* hemlock trees in the southern Appalachian Mountains w weeks after January 1, 2017. Find a formula for $J(w)$ in terms of any or all of the functions H and I .
- Let $F(d)$ be the fraction of the hemlock trees in the southern Appalachian Mountains that are infested d days after January 1, 2017. Find a formula for $F(d)$ in terms of any or all of the functions H and I .
- Let $K(d)$ be the total number of hemlock trees in the southern Appalachian Mountains, in thousands, d days after January 1, 2017. Find a formula for $K(d)$ in terms of any or all of the functions H and I .
- The number of hemlock trees I that are infested in the southern Appalachian Mountains is inversely proportional to the cube of the total amount of money M (in millions of dollars) that the government spends combating the spread of the adelgids. Write a formula for I in terms of M , assuming that there were 2,000 infested trees when the government had spent 3 million dollars.

- (e) The number of hemlock woolly adelgids A (in millions) is also a function of the amount of money M (in millions of dollars) that the government spends to try to preserve the hemlock trees, and is given by:

$$A(M) = \frac{4}{M} \quad \text{for } M \geq 4.$$

Find the equation of the horizontal asymptote of $y = A(M)$, and interpret this horizontal asymptote in *practical terms*.

