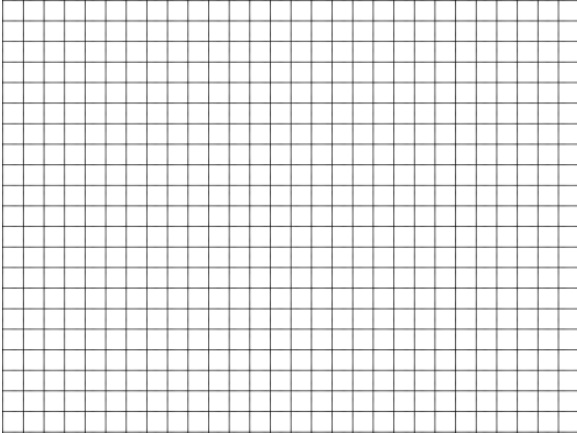Lesson 6.8 – Solving Trigonometric Equations III – x-intercepts and Modeling

Warm-Up:

1. Consider the function $f(x) = 2\cos x + 1$
    a. Sketch a graph of the function below.   b. Algebraically find the intercepts from $[0, 2\pi)$.

2. Solve for all values of x, $[0, 2\pi)$. (Express your answers in radians).
   $2\sin x + \cos x = 0$

3. Mr. Braza is taking an intensive ride on his 5th bike. At $t = 2.3$ seconds the peddle on his bike is closest to the ground at a height of 8 inches. The pedal reaches its highest point of 22 inches 0.7 seconds later.
    a. Find an equation that represents the height of the peddle over time.

    b. Find all the times that the pedal is exactly one foot off the ground in the first 5 seconds of his ride.

4. A sharpshooter intends to hit a target at a distance of 1000 yards with a gun that has a muzzle velocity v_0 of 1200 feet per second (see figure). Neglecting air resistance, determine the gun's minimum angle of elevation θ is the range is given by $r = \frac{1}{32} v_0^2 \sin^2 2\theta$.

5. The monthly sales $S(t)$ (in thousands of units) of a seasonal product are approximated by
$$S(t) = 74.50 + 43.75 \sin\left(\frac{\pi t}{6}\right)$$
Where t is the time (in months), with $t = 1$ corresponding to January. Determine the months when sales exceed 100,000.