Spring 2025 Laird Homework 6

Question 1

(A) Consider the angle θ. If $\sin(\theta) = 0.7$, what is $\cos(\theta)$?

(B) Consider the angle θ. If $\cos(\theta) = 0.5$, what is $\sin(\theta)$?

Question 2

(A) Let $f(x) = \sin^2(x) - 1$. Find all zeros of $f(x)$.

Question 3

(A) In the xy-plane, the terminal ray of an angle in standard position intersects the *unit circle* at the point with coordinates (a, b). The terminal ray of a second angle in standard position intersects the circle at the point with coordinates (c, d). If the measure of the second angle is twice the measure of the first angle, what are the coordinates c and d, in terms of a and b?

Question 4

The table presents values of y at selected values of x:

x	y
-2	10
-1	15
1	40
2	56

(A) Find the exponential regression model $\hat{y} = ab^x$ that best fits the data.

(B) What is the value of $\hat{y}$ predicted by the exponential function model for $x = 1.5$?

(C) Calculate the residual for the $x = 1$ data point using your model found in Part A.

(D) Does there appear to be a pattern in the residuals of your exponential regression model? If so, describe it.

(E) Find the linear regression model $\hat{y} = mx + b$ that best fits the data.

(F) Does there appear to be a pattern in the residuals of your linear regression model? If so, describe it.

Question 5

The table gives the temperature, in degrees Fahrenheit, in Albuquerque on a given day at selected times t, in hours past midnight:

Time t (hours past 12 midnight)	Temperature (°F)
0	91
6	83
11	92
18	102
23	92

(A) Find the sinusoidal regression model $y = a\sin(b(t+c)) + d$ that best fits the data.

(B) What is the value of y predicted by the sinusoidal function model for $t = 15$?

(C) Calculate the residual for the $t = 11$ data point using your model found in Part A.

Question 6

A Ferris wheel with a 70-foot diameter rotates at a constant speed, taking 100 seconds to complete one full rotation. The lowest position a rider will ever reach is 5 feet off the ground. At time $t = 0$, Mr. Laird boards the Ferris wheel at its lowest point.

A) Write a function that gives the height of Mr. Laird above the ground as a function of time t (in seconds). You may use either sine or cosine.

B) What is Mr. Laird's height at $t = 62$ seconds? (Please use a calculator.)