1. Three of the following points are collinear. How can you tell which ones they are? Find the equation of the line they are on. \((0, -3), (4, -\frac{1}{2}), (5, 1), (-1, -8)\)

\((0, -3)\) is not on the line \(y - 1 = \frac{3}{2}(x - 5)\)

2. Solve the inequality \(x^2 + x - 12 \geq 0\).

\(x \leq -4\) or \(x \geq 3\)

3. What does it mean for a function to be even? What does this mean graphically? What does it mean for a function to be odd? What does this mean graphically? Think of a function that is neither even nor odd. Is there a function that is both even and odd?

Even: \(f(-x) = f(x)\), symmetric about \(y\)-axis, odd: \(f(-x) = -f(x)\), symmetric about origin, \(f(x) = x^2 + x\) is not even nor odd, \(g(x) = 0\) is both even and odd (only function this is true for)

4. Determine if each of the following functions are even, odd, or neither:

(a) \(f(x) = \sin(x)\) odd
(b) \(f(x) = \cos(x)\) even
(c) \(f(x) = x^3 + x^{-1}\) odd
(d) \(f(x) = x^2 + x\) neither
(e) \(f(x) = e^x\) neither
(f) \(f(x) = x^{-2}\) even

5. Below there are four cases for \(f\) and \(g\). Decide if \(f + g\), \(fg\), and \(g \circ f\) are even, odd, or neither.

(a) \(f\) is even, \(g\) is even: all 3 are even
(b) \(f\) is odd, \(g\) is odd: \(f + g\) and \(g \circ f\) are odd, \(fg\) is even
(c) \(f\) is even, \(g\) is odd: \(f + g\) is neither, \(fg\) is odd, \(g \circ f\) is even
(d) \(f\) is odd, \(g\) is even: \(f + g\) is neither, \(fg\) is odd, \(g \circ f\) is even

6. Draw the unit circle, with the values corresponding to multiples of \(\frac{\pi}{4}\) and \(\frac{\pi}{6}\).

7. Sketch graphs of \(\sin(x)\) and \(\cos(x)\). Now sketch a graph of \(\cos(x - \frac{\pi}{2})\). What do you notice?

\(\cos(x - \frac{\pi}{2})\) is the same as \(\sin(x)\)
8. Below are a number of different trigonometric expressions involving or related to \( \sin x \). Identify which expressions are equal to each other. (Warning: Not everything is in a group and there are some groups of more than 2!)

(a) \( \sin^2 x \)  
(b) \( 2 \sin x \)  
(c) \( (\csc x)^2 \)  
(d) \( \sin^2 x \)  
(e) \( (\sin x)^{-1} \)  
(f) \( \frac{\sin 2x}{\cos x} \)  
(g) \( \csc x \)  
(h) \( \arcsin x \)  
(i) \( 1 - \cos^2 x \)  
(j) \( (\sin x)^2 \)  
(k) \( \frac{1}{\sin x} \)  
(l) \( \sin -x \)  
(m) \( \sin 2x \)  
(n) \( \sin \frac{\pi}{2} \)

1 and h; g and e and k; b and f; d and e; o and a and j and i

9. Sketch the graphs of the following functions:

(a) \( y = \sin(x) \)  
(b) \( y = \sin(2x) \), shrinks period to \( \pi \)  
(c) \( y = 4 \sin(2x) \), multiplies amplitude to 4  
(d) \( y = 4 \sin(2x - \frac{\pi}{2}) \), shifts right by \( \frac{\pi}{2} \)  
(e) \( y = 4 \sin(2x - \frac{\pi}{2}) - 5 \), shifts down by 5

10. If \( \cos(\theta) = \frac{2}{\sqrt{7}} \) and \( 0 < \theta < \frac{\pi}{2} \), find \( \sin(\theta) \) and \( \tan(\theta) \). What if \( \frac{\pi}{2} < \theta < \pi \)? Or \( \frac{3\pi}{2} < \theta < 2\pi \)?

\[
\sin \theta = \frac{\sqrt{15}}{\sqrt{7}}, \tan \theta = \frac{\sqrt{15}}{2}; \text{ no } \theta \text{ with } \frac{\pi}{2} < \theta < \pi \text{ and } \cos \theta > 0; \sin \theta = -\frac{\sqrt{15}}{\sqrt{7}}, \tan \theta = -\frac{\sqrt{15}}{2}
\]

11. Solve the following:

(a) \( \sin^2 x + 2 \sin x = -1, x = \frac{-\pi}{2} + 2\pi k \)  
(b) \( \cos^3 x - \cos x = 0, x = \frac{\pi}{2} + \frac{\pi}{2} k \)

\text{Hint: It might be easier to make a substitution to simplify the equation first.}

12. On the printed flashcards, match the graphs with their functions.

13. For \( c > 1 \), describe what each of the following does:

(a) \( f(x) + c \), shift up by \( c \)  
(b) \( f(x) - c \), shift down by \( c \)  
(c) \( f(x + c) \), shift left by \( c \)  
(d) \( f(x - c) \), shift right by \( c \)  
(e) \( cf(x) \), stretch vertical by \( c \)  
(f) \( \frac{1}{c} f(x) \), shrink vertical by \( c \)  
(g) \( f(cx) \), shrink horizontal by \( c \)  
(h) \( f\left(\frac{x}{c}\right) \), stretch horizontal by \( c \)  
(i) \( -f(x) \), flip over y-axis  
(j) \( f(-x) \), flip over y-axis

\text{An Ending Thought: You must do the things you think you cannot do.}

– Eleanor Roosevelt