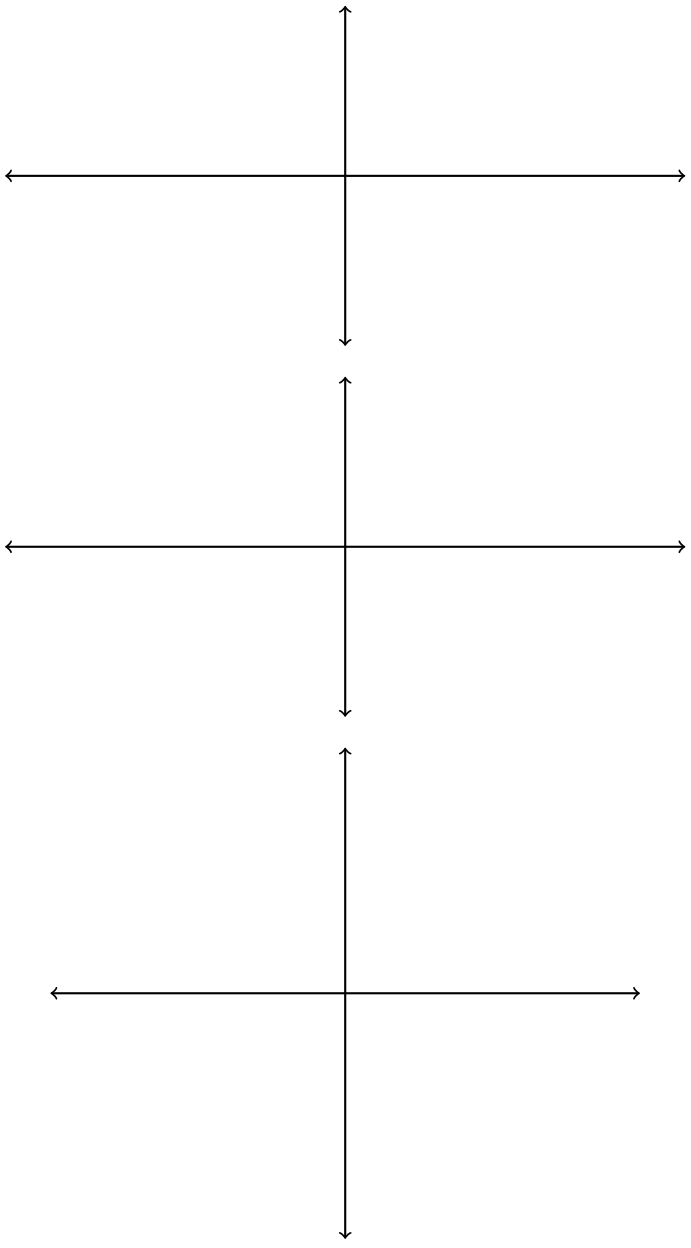
## 2.4/2.5: Tangent and Graphs

**Tips**:

- Remember the *definitions* of sin and cos: $\cos(\theta)$ is the $x$-coordinate of the point on the unit circle corresponding to $\theta$, and $\sin(\theta)$ is its $y$-coordinate. (Don't forget this definition!)
- Tangent is defined as
$$\tan(\theta) := \frac{\sin(\theta)}{\cos(\theta)}$$
- $\tan(\theta)$ is a $180°$-periodic function.

1. Make careful graphs of $\sin(\theta)$, $\cos(\theta)$ and $\tan(\theta)$.

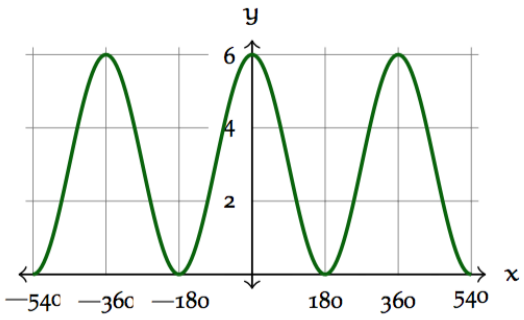


2. A cannon fires a cannonball in a straight line at an upward angle of $29°$. If the cannon needs to shoot over a wall that is 20 feet high, how far away from the wall does it need to be placed?

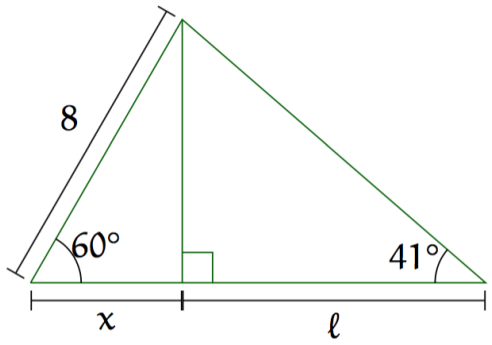
3. A box fan sits in a window 4 feet off of the ground, and each blade of the fan is 1 foot long. The blades rotate 20 times each second. Supposing that a blade starts horizontally, find a function that describes the height $y = f(t)$ of the tip of the blade above the ground.

4. Sketch graphs of the functions $f(t) = 6\cos(x) + 4$ and $g(t) = 20\sin(2x) - 1$.

5. Given the graph of $f(x)$ below, write an equation for $f(x)$.




6. Find $x$ and $\ell$ in the figure below.




7. Suppose that a line $y = ax + b$ is such that it passes through the origin and makes an angle of $120°$ from the horizontal. Determine the equation of the line.