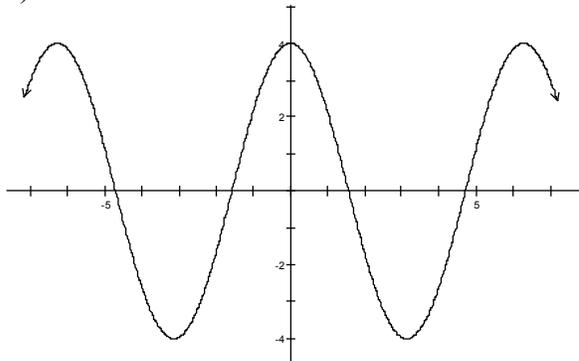Homework 4 Math 48C Mitchell Schoenbrun
8.4 P. 558 1-5, 38, 39

1. $f(\theta) = 4\cos(\theta)$

a) period $= \dfrac{360°}{1} = 360° = 2\pi \ radians$	frequency $= \dfrac{1}{period} = \dfrac{1}{2\pi}$
amplitude $= |4| = 4$	midline $y = 0$

b) 4, -4
c)

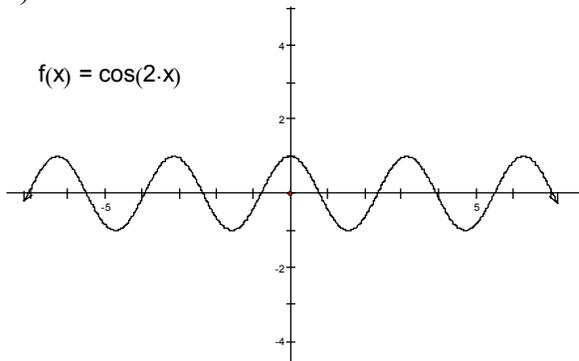d) $\dfrac{\pi}{2} + \pi n \ n \in \mathbb{Z}$

e) 4
f) The amplitude is stretched above and below the midline from 1 to 4 and -1 to -4

2. $f(\theta) = \cos(2\theta)$

a) period $= \dfrac{2\pi}{2} = \pi$	frequency $= \dfrac{1}{period} = \dfrac{1}{\pi}$
amplitude $= |1| = 1$	midline $y = 0$

b) 1, -1
c)

f(x) = cos(2·x)

d) $\dfrac{\pi}{4} + \dfrac{\pi}{2} n \ n \in \mathbb{Z}$
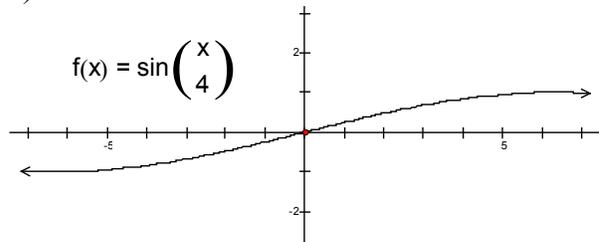
e) 1
f) The frequency is compressed from 2π to π

3. $f(\theta) = \sin\left(\dfrac{1}{4}\theta\right)$

a) period = $\dfrac{360°}{1/4} = 1540° = 8\pi$ *radians*	frequency = $\dfrac{1}{period} = \dfrac{1}{8\pi}$
amplitude = $|1| = 1$	midline $y = 0$

b) 1, -1

c)

$f(x) = \sin\left(\dfrac{x}{4}\right)$

d) $4\pi n\ n \in \mathbb{Z}$

e) 0

f) The frequency is expanded from 2π to 8π

4. $f(\theta) = \cos\left(\theta - 120°\right)$

a) period = $\dfrac{360°}{1} = 360° = 2\pi$ *radians*	frequency = $\dfrac{1}{period} = \dfrac{1}{2\pi}$
amplitude = $|1| = 1$	midline $y = 0$

b) 1, -1

c)

$f(x) = \cos\left(x - \dfrac{2\cdot\pi}{3}\right)$
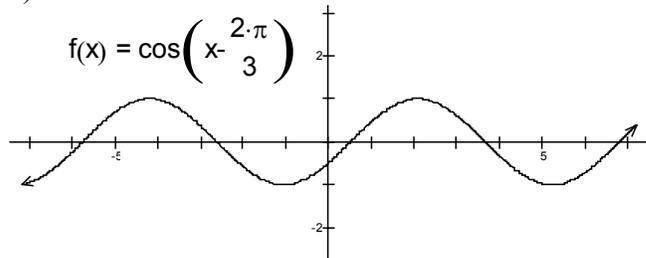
d) $\dfrac{\pi}{6} + \pi n\ n \in \mathbb{Z}$
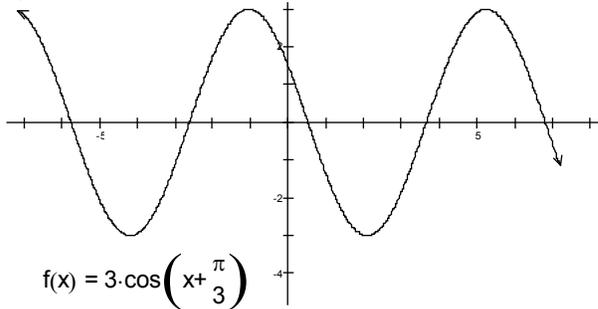
e) -1/2

f) The function is phase shifted $\dfrac{2\pi}{3}$

5. $f(\theta) = 3\cos\left(\theta + \dfrac{\pi}{3}\right)$

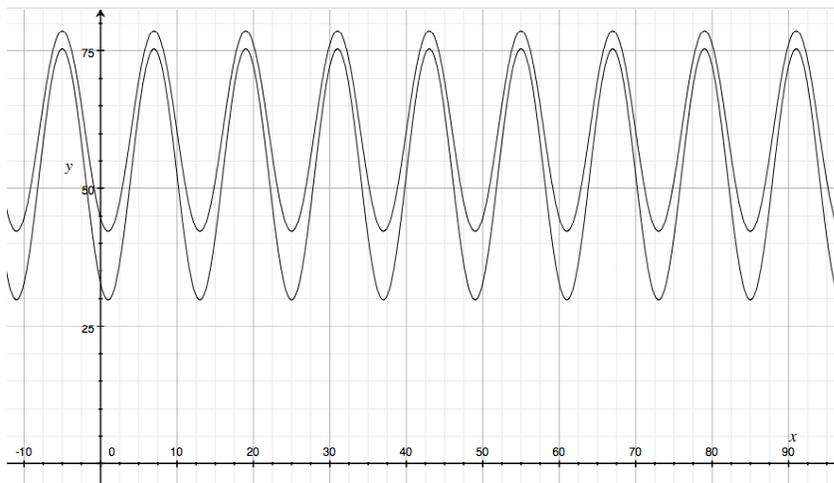| a) period $= 2\pi$	frequency $= \dfrac{1}{period} = \dfrac{1}{2\pi}$
amplitude $= \lvert 3 \rvert = 3$	midline $y = 0$

b) 3, -3

c)

$f(x) = 3 \cdot \cos\left(x + \dfrac{\pi}{3}\right)$

d) $\dfrac{5\pi}{6} + \pi n \;\; n \in \mathbb{Z}$

e) 3/2

f) The function is phase shifted $-\dfrac{\pi}{2}$ and the amplitude is stretched from 1 to 3 and -1 to -3

38.

Both are periodic with the same period, 12 months.
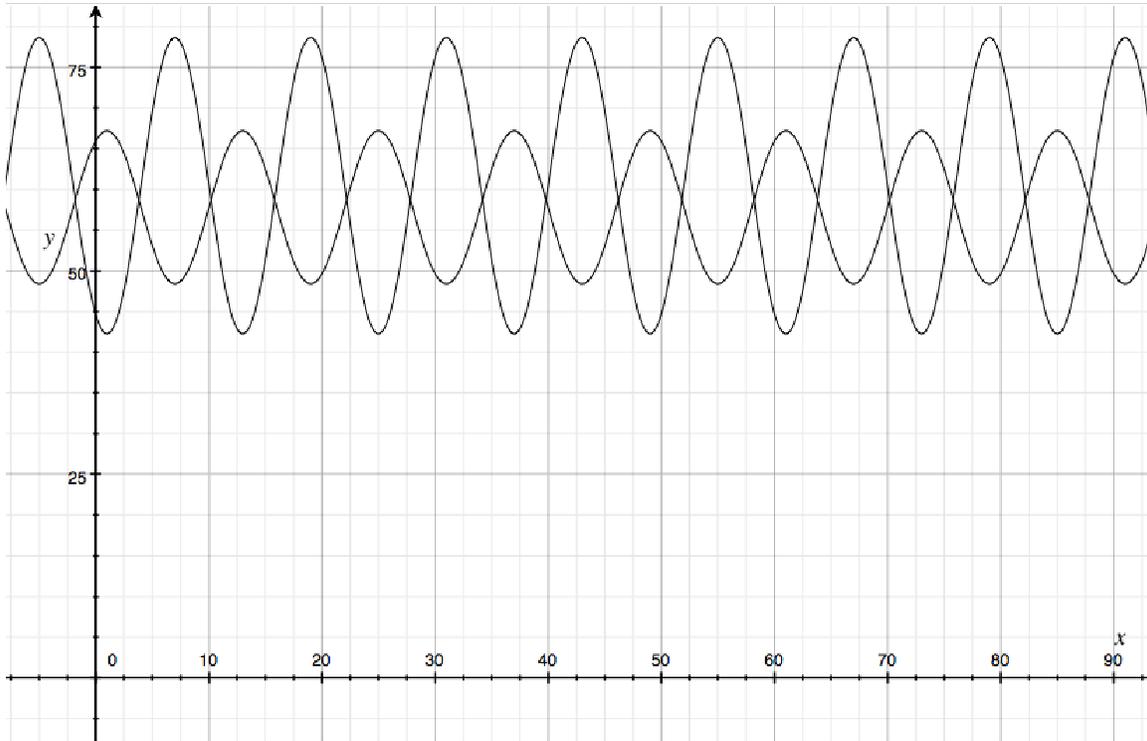Both look well modeled by sinusoids.
The midline of Huntsville is higher (hotter).
The amplitude (range of temperatures) of Indianapolis is slightly greater.

39.

a)

b) They both have the same period.
They are out of phase.
The midline of Sydney is lower meaning lower average temperatures.
The amplitude of Sydney is less meaning more temperate conditions.
The peaks are 1/2 period out of sync meaning it is summer in Sydney when it is winter in Huntsville.

c) It fits the data well and at the start of the year the temperature is near its peak.

d) The latitude of Huntsville is 34.7°N and Sydney is at 33.9°S, so Sydney is slightly closer to the equator. However this is to small a distance to account for the temperature differences. It seems more likely that Sydney being on the coast has its temperature affected by the ocean, whereas Huntsville is inland.

e) The phase shift is 1/2 the period, which corresponds to 6 months.

f) $S(m) = -9.4 \cos\left(\dfrac{\pi}{6}(m-7)\right) + 57.8$