

Review Chapter 5 (Solution)

1. Convert $132^{\circ}52'41''$ to decimal degrees.

$$\begin{aligned}1^{\circ} &\rightarrow 60' \\x^{\circ} &\rightarrow 52' \\x^{\circ} &= \frac{1^{\circ} \times 52'}{60'} \\&= \frac{1 \times 52}{60} \\&= \frac{13^{\circ}}{15}\end{aligned}$$

$$\begin{aligned}1^{\circ} &\rightarrow 3600'' \\x^{\circ} &\rightarrow 41'' \\x^{\circ} &= \frac{1 \times 41}{3600} \\&= \frac{41}{3600}\end{aligned}$$

$$\begin{aligned}132^{\circ}52'41'' &= 132 + \frac{13}{15} + \frac{41}{3600} \text{ degree} \\&= 132.88 \text{ degree}\end{aligned}$$

2. Without using a calculator, evaluate the followings:

a. $\arccos 1$, letting $y = \arccos 1$, Solution is: 0

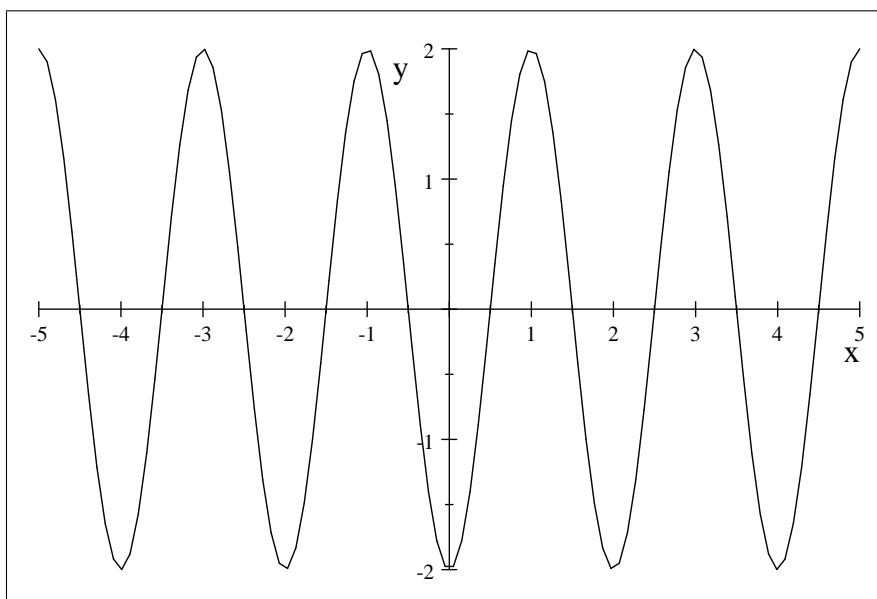
b. $\arcsin \frac{\sqrt{2}}{2} = \frac{\pi}{4}$

c. $\arctan \sqrt{3} = \frac{\pi}{3}$

d. $\csc(\arctan(-1)) = -\sqrt{2}$

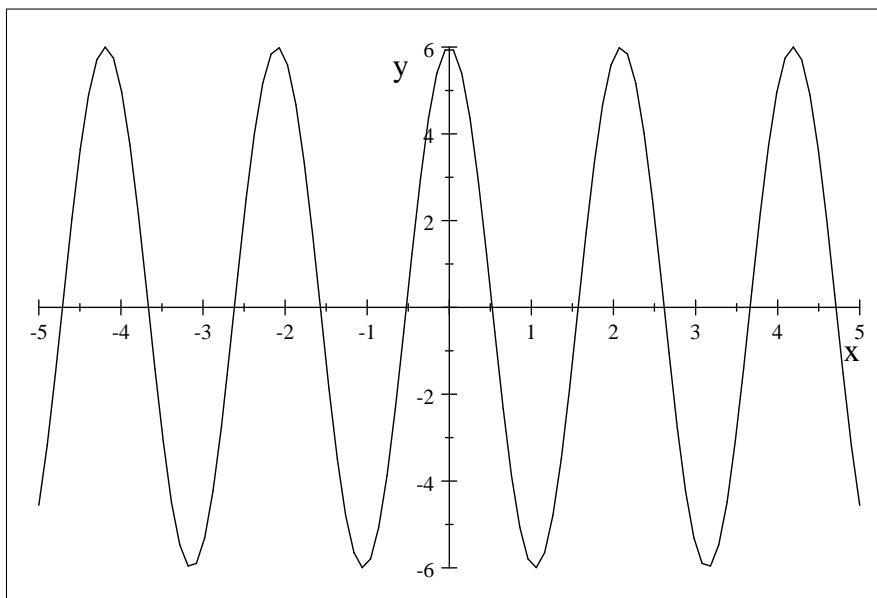
3. Sketch the graph of the function

$$f(x) = -2 \cos(\pi x).$$



4. The equation of the graph below is of the form

$$f(x) = A \cos Bx.$$



a. What is the maximum value obtained by f

6

b. What is the period of the function f

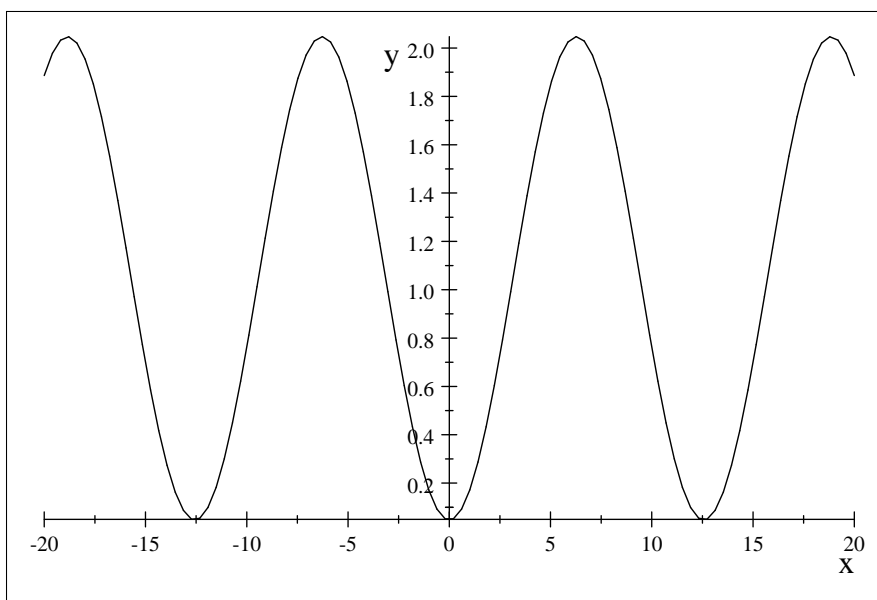
$$\frac{2\pi}{3}$$

c. Find A , and B

$$A = 6, B = 3$$

5. Without a calculator, sketch the graph of

$$g(x) = -\sin\left(\frac{x}{2} + \frac{\pi}{2}\right) + \frac{\pi}{3}.$$



6. Given the function

$$g(x) = -2 \cos\left[-\frac{\pi}{2}x - \frac{\pi}{4}\right]$$

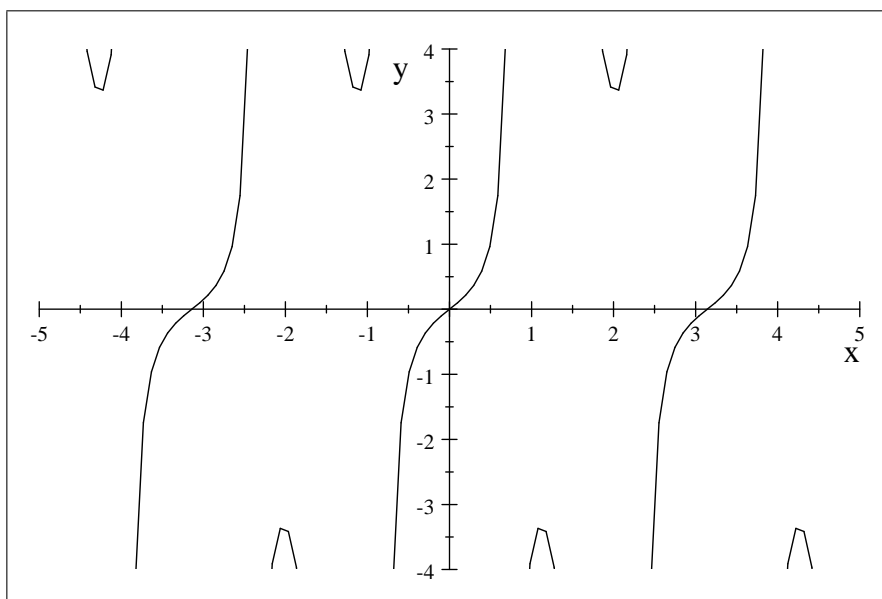
Find the amplitude, the period and the phase shift of the harmonic function g .

$$\begin{aligned} \text{amplitude} &= 2 \\ \text{period} &= \left| \frac{2\pi}{-\frac{\pi}{2}} \right| = 4 \\ \text{phase shift} &= \frac{-C}{B} = \frac{\frac{\pi}{4}}{-\frac{\pi}{2}} = -\frac{1}{2} \end{aligned}$$

7. Determine if the following functions are odd or even

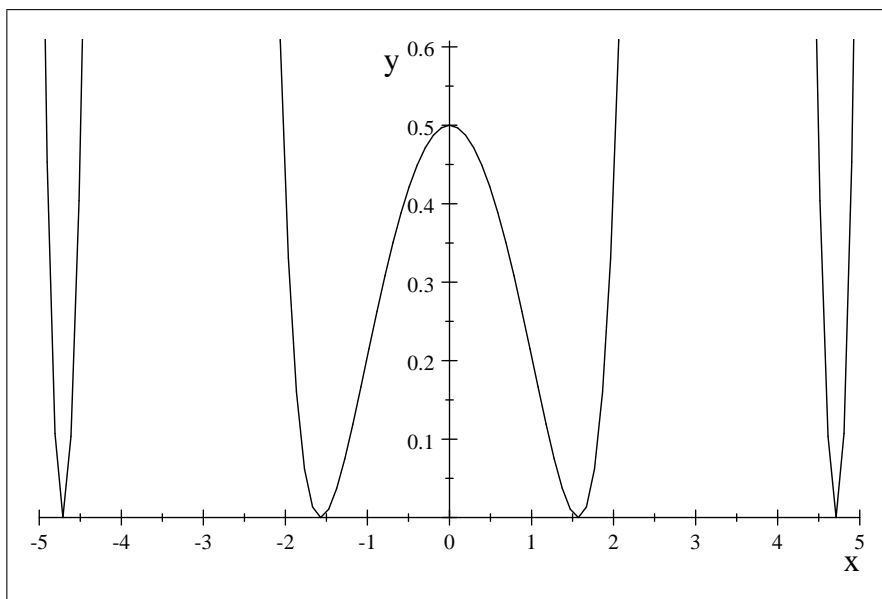
a. h is odd

$$h(x) = \frac{2 \sin^2(x)}{\cos(2x) \sin(2x)}.$$



b. p is even

$$p(x) = \frac{x^2 \cos^2(x)}{\tan(x) \sin(2x)}.$$



c. Use your graphing calculator to plot the functions above and confirm your answers

8. (Similar to webwork problems) A wheel centered at the point $(-4, 5)$ of radius $\sqrt{3}$ is rotating counterclockwise. Let θ be the angle corresponding to a point p located on the wheel,

a. Write the y -coordinate of the point p as a function of θ for $0 \leq \theta \leq \frac{\pi}{2}$.

b. Write the x -coordinate of the point p as a function of θ for $0 \leq \theta \leq \frac{\pi}{2}$.

9. Solve the equation

$$\cos x = -\frac{1}{2}.$$

Solution is:

$$\left\{ -\frac{2}{3}\pi + 2\pi k \mid k \in \mathbb{Z} \right\} \cup \left\{ \frac{2}{3}\pi + 2\pi k \mid k \in \mathbb{Z} \right\}.$$

10. Solve the equation

$$\csc x = -\sqrt{2}.$$

Solution is:

$$\left\{ -\frac{1}{4}\pi + 2\pi k \mid k \in \mathbb{Z} \right\} \cup \left\{ \frac{5}{4}\pi + 2\pi k \mid k \in \mathbb{Z} \right\}.$$

11. Find the perimeter of a square inscribed in circle of radius 100.

$$\begin{aligned} \frac{\frac{s}{2}}{100} &= \sin \frac{\pi}{4} \\ \frac{s}{2} &= 100 \sin \frac{\pi}{4} \\ s &= 200 \sin \frac{\pi}{4}. \\ \text{perimeter} &= 4s \\ &= 800 \sin \frac{\pi}{4} \\ &= 400\sqrt{2}. \end{aligned}$$

12. A wind turbine of rotor diameter 40 *feet* makes 80 revolutions per minute. Find the angular speed and the linear speed of the rotor tip.

13. Prove the identity

$$\begin{aligned} \sin(-\theta) \sec(-\theta) \cot(-\theta) &= 1 \\ \sin(\theta) \sec(\theta) \frac{\cos \theta}{\sin \theta} &= \sec(\theta) \cos(\theta) \\ &= \frac{1}{\cos(\theta)} \cos(\theta) \\ &= 1. \end{aligned}$$