PRACTICE TEST, pages 567–570

1. **Multiple Choice** Given $\cos\theta = 0.4$, which is the value of $\cos(\theta + \pi)$?

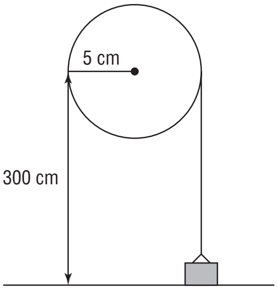
A. 0.6 **B.** −0.6 **C.** 0.4 [✓ **D.**] −0.4

2. **Multiple Choice** A sinusoidal function $f(x)$ has period 5 and passes through the point P(5, 0). Which of the following values can be determined from this information?

I. $f(0)$ II. $f(5)$ III. $f(15)$

A. I only **B.** II only **C.** III only [✓ **D.**] I, II, and III

3. A pulley with radius 5 cm has its axle 300 cm above the ground. A load is on the ground. Through which positive angle will the pulley have to rotate to lift the load 100 cm? Give the answer in radians and to the nearest degree.



The diagram is not drawn to scale.

The arc length is 100 cm.

Angle measure in radians is: $\dfrac{\text{arc length}}{\text{radius}} = \dfrac{100}{5}$

$= 20$

An angle of 20 radians $= 20\left(\dfrac{180°}{\pi}\right)$

$= 1145.9155\ldots°$

The angle measures are 20 radians and approximately 1146°.

4. Determine the value of each trigonometric ratio. Use exact values where possible; otherwise write the values to the nearest hundredth.

a) $\sin 505°$

$= \sin 145°$

$\doteq 0.57$

b) $\cos\left(-\dfrac{7\pi}{6}\right)$

$= \cos\left(\dfrac{5\pi}{6}\right)$

$= -\dfrac{\sqrt{3}}{2}$

c) $\csc(-570°)$

$= \csc 150°$

$= \dfrac{1}{\sin 30°}$

$= 2$

d) $\tan\dfrac{9\pi}{4}$

$= \tan\dfrac{\pi}{4}$

$= 1$

e) $\sec 51°$

$= \dfrac{1}{\cos 51°}$

$\doteq 1.59$

f) $\cot\left(-\dfrac{11\pi}{12}\right)$

$= \cot\dfrac{\pi}{12}$

$= \dfrac{1}{\tan\dfrac{\pi}{12}}$

$\doteq 3.73$

5. Given $\sin\theta = -\frac{3}{7}$ and $\tan\theta > 0$

a) Determine the values of the other 5 trigonometric ratios for θ.

The terminal arm of the angle lies in Quadrant 3, where x is negative.

Use: $x^2 + y^2 = r^2$ **Substitute:** $y = -3, r = 7$

$$x^2 + 9 = 49$$
$$x = -\sqrt{40}$$

$\csc\theta = \frac{r}{y} = -\frac{7}{3}$ $\cos\theta = \frac{x}{r} = -\frac{\sqrt{40}}{7}$ $\sec\theta = \frac{r}{x} = -\frac{7}{\sqrt{40}}$ $\tan\theta = \frac{y}{x} = \frac{3}{\sqrt{40}}$ $\cot\theta = \frac{x}{y} = \frac{\sqrt{40}}{3}$

b) For $0 \leq \theta < 2\pi$, determine the measure of θ in radians and in degrees, to the nearest tenth.

The reference angle is $\sin^{-1}\left(\frac{3}{7}\right)$.

In degrees, the reference angle is $25.3769...°$

So, $\theta = 180° + 25.3769...°$
$\doteq 205.4°$

In radians, the reference angle is $0.4429...$

So, $\theta = \pi + 0.4429...$
$\doteq 3.6$

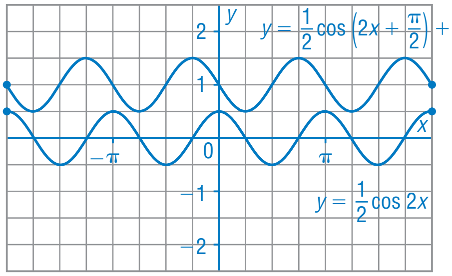
6. Given the function: $y = \frac{1}{2}\cos\left(2x + \frac{\pi}{2}\right) + 1$

a) Determine these characteristics of the function: amplitude; period; phase shift

Write the function as: $y = \frac{1}{2}\cos 2\left(x + \frac{\pi}{4}\right) + 1$

The amplitude is $\frac{1}{2}$. The period is $\frac{2\pi}{2} = \pi$. The phase shift is $-\frac{\pi}{4}$.

b) Graph the function for $-2\pi \leq x \leq 2\pi$.



Sample response: Graph $y = \frac{1}{2}\cos 2x$, then translate several points on the graph $\frac{\pi}{4}$ units left and 1 unit up. Join these points for the graph of $y = \frac{1}{2}\cos\left(2x + \frac{\pi}{2}\right) + 1$.

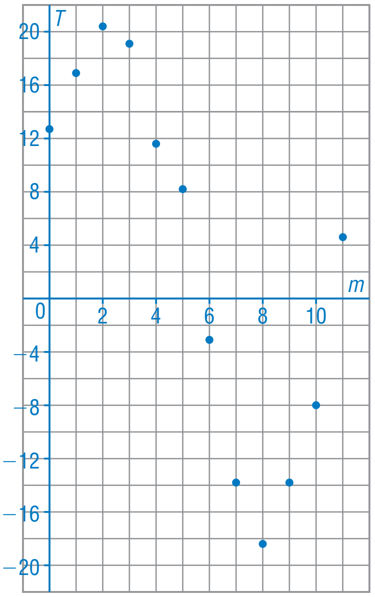
c) Determine these characteristics of the graph of
$y = \frac{1}{2}\cos\left(2x + \frac{\pi}{2}\right) + 1$: domain; range; zeros

The domain is: $-2\pi \leq x \leq 2\pi$; the range is: $0.5 \leq y \leq 1.5$; there are no zeros.

7. The table shows the mean monthly temperatures for Winnipeg, MB, from May, 2010 to April, 2011.

Month	Mean monthly temperature (°C)
May	12.7
June	16.9
July	20.4
Aug.	19.1
Sept.	11.6
Oct.	8.2
Nov.	−3.1
Dec.	−13.8
Jan.	−18.4
Feb.	−13.8
Mar.	−8.0
Apr.	4.6

Mean Monthly Temperature for Winnipeg



a) Graph the data, then write an equation of a sinusoidal function that models the data.

Sample response: Let T represent the mean monthly temperatures in degrees Celsius, and m represent the months numbered 0 to 11.
Use a cosine function to model the data: $T(m) = a\cos b(m - c) + d$
From the graph:

- **the first maximum point has approximate coordinates (2, 20.4) and the first minimum point has approximate coordinates (8, −18.4), so the equation of the centre line is approximately:**
  $T = \frac{20.4 - 18.4}{2}$, or $T = 1$; so $d \doteq 1$
- **the amplitude is approximately: $20.4 - 1 = 19.4$; so $a \doteq 19.4$**
- **the period is approximately 12 months; so $b \doteq \frac{2\pi}{12}$, or $\frac{\pi}{6}$**
- **the phase shift is the m-coordinate of the first maximum point; so $c \doteq 2$**

A function that approximates the data is: $T(m) = 19.4\cos\frac{\pi}{6}(m - 2) + 1$

b) Use graphing technology to estimate the mean monthly temperature for April 2010 and for May 2011.

Graph: $y = 19.4 \cos \frac{\pi}{6}(x - 2) + 1$.

For April 2010, $x = -1$; from the graph, when $x = -1$, $y = 1$

So, the mean monthly temperature for April 2010 was approximately 1°C.

For May 2011, $x = 12$; from the graph, when $x = 12$, $y = 10.7$

So, the mean monthly temperature for May 2011 was approximately 10.7°C.