

Part I - Multiple Choice Questions

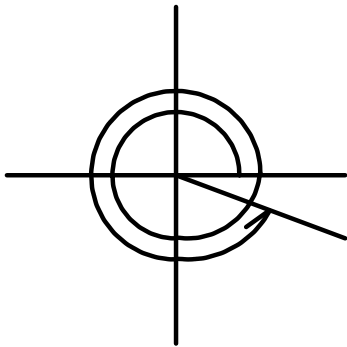
Complete each of the following with the best fitting answer and place your answer in the spaces provided at the beginning of Part II. (30 marks)

1. The point $(1, 0)$ is rotated 200° about the origin. What are the coordinates of the point after the rotation?

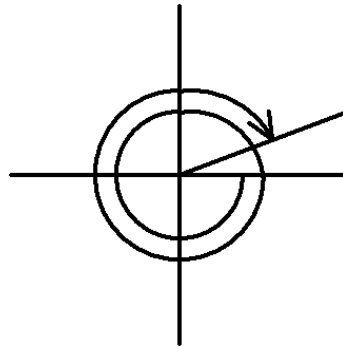
- A) $(-0.939, -0.342)$
- B) $(0.939, -0.342)$
- C) $(-0.939, 0.342)$
- D) $(0.939, 0.342)$

2. Which diagram below best represents the position of the terminal arm for a -700° rotation?

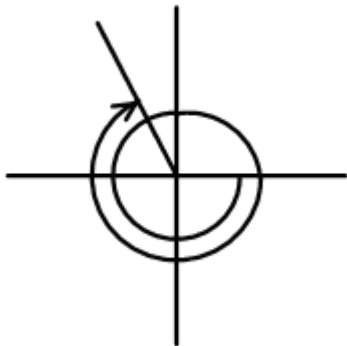
A)



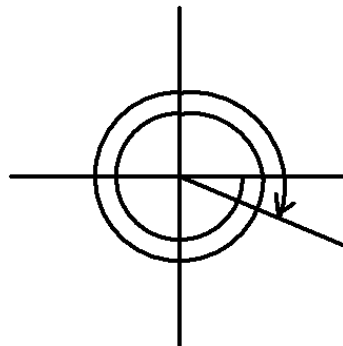
B)



C)



D)

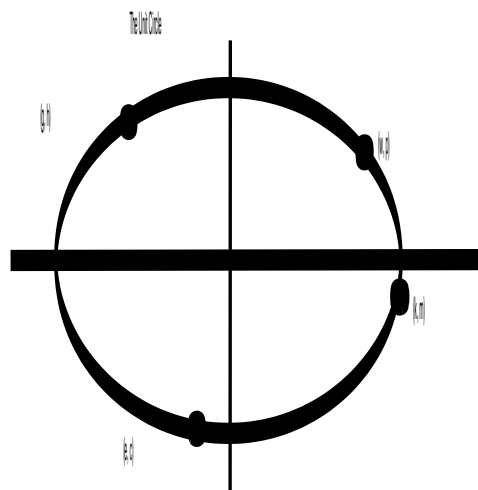


3. Which one of the following angles is co-terminal with 526° ?

- A) -194°
- B) -14°
- C) 346°
- D) 706°

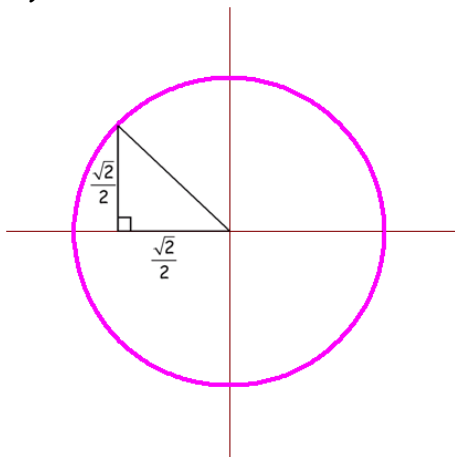
4. Which point would best represent the coordinates of the point $(1, 0)$ after it has been rotated -460° about the origin?

- A) (g, h)
- B) (w, p)
- C) (e, c)
- D) (k, m)

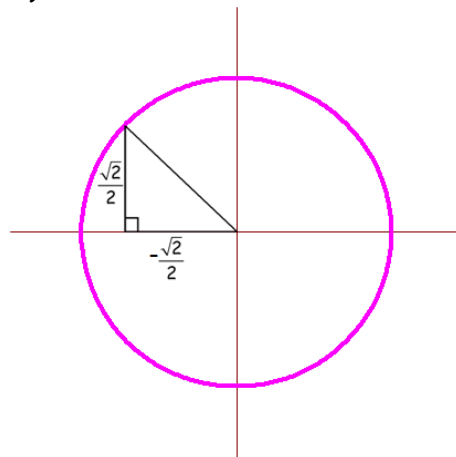


5. Referring to the diagram above, which letter corresponds to the $\sin(485^\circ)$?
- A) c B) m C) p D) h
6. When respect to angles of rotation within the unit circle, in which quadrant(s) is the sine value positive?
- A) 1 and 2 B) 1 and 4 C) 2 and 3 D) 3 only
7. Which one of the following statements is true concerning the special case right triangle whose angles measure 30° , 60° and 90° ?
- A) With a hypotenuse of 1 the shortest leg will be $\frac{1}{2}$
- B) With a hypotenuse of 1 the shortest leg will be $\frac{\sqrt{3}}{2}$
- C) With a hypotenuse of 1 the shortest leg will be $\frac{\sqrt{2}}{2}$
- D) With a hypotenuse of 1 both legs will be $\frac{\sqrt{2}}{2}$
8. Which one of the following correctly displays the placement and labelling of a special case triangle within the unit circle?

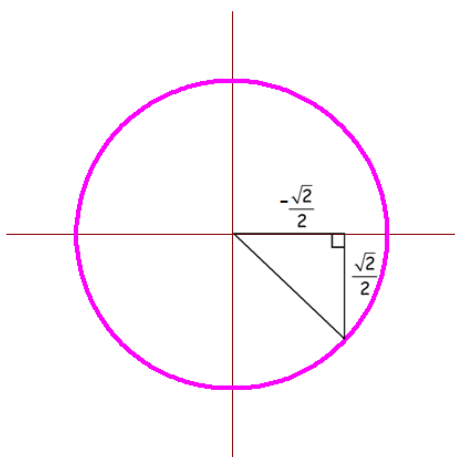
A)



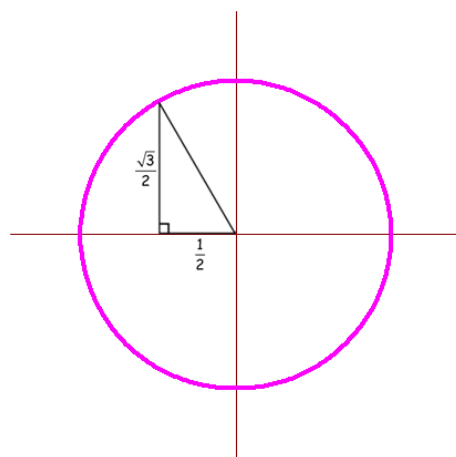
B)



C)



D)



9. What is the exact location of the image point for the following rotation?

$$R_{120^\circ} 1, 0$$

- A) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ B) $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ C) $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ D) $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

10. In which quadrant would you find $\sin(\theta) = -0.643$ and $\tan(\theta) = -0.839$?

- A) 1 B) 2 C) 3 D) 4

11. What is the exact value of $\tan(-390^\circ)$?

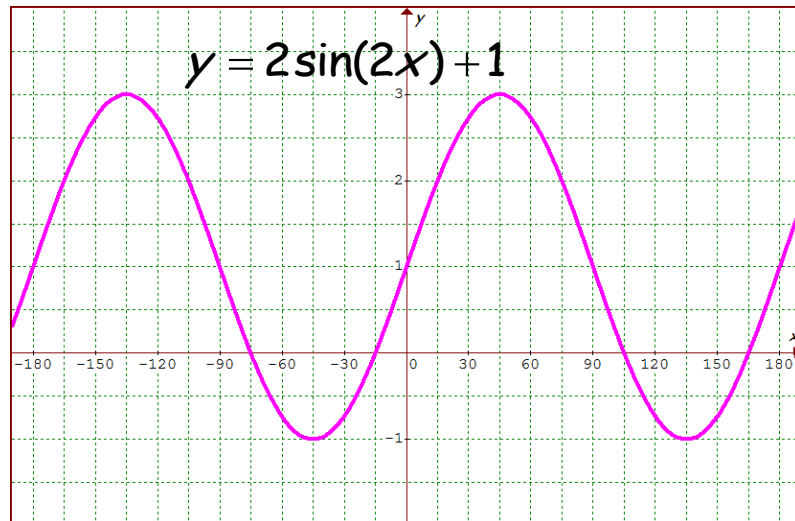
- A) $\frac{\sqrt{3}}{3}$ B) $\sqrt{3}$ C) $-\sqrt{3}$ D) $-\frac{\sqrt{3}}{3}$

12. What is the simplest numerical value for the expression below?

$$\frac{4 - 2\cos(-60^\circ)}{2\sin(120^\circ)}$$

- A) $\frac{3}{\sqrt{3}}$ B) $\frac{5\sqrt{3}}{3}$ C) 2 D) $\sqrt{3}$

13. Referring to the graph below, what are the solutions for the equation $2\sin(2x) + 1 = 0$?



- A) -135 and 45
 B) -180, -90, 0, 90 and 180
 C) -75, -15, 105 and 165
 D) -45 and 135
14. If $\sin(x) = -\frac{1}{2}$ for $0^\circ \leq x < 360^\circ$ what are the values for x ?

- A) 30° and 60° B) 30° and 150°
 C) 30° and 330° D) 210° and 330°

15. What are the solutions to the following equation?

$$4\cos(x) = -3$$

$$\text{A) } x = \begin{cases} 41.4 + 360k \\ 318.6 + 360k \end{cases} \quad k \in I \qquad \text{B) } x = \begin{cases} 138.6 + 360k \\ 221.4 + 360k \end{cases} \quad k \in I$$

$$\text{C) } x = 180 + 360k \quad k \in I \qquad \text{D) } x = 0 + 360k \quad k \in I$$

Part II. Long Answer Questions

1. Determine the exact value of the following. Be sure to show all significant workings and leave your answer in simplest form.

a) $\frac{\sin(120^\circ)}{\cos(-330^\circ)} - \frac{\sin(450^\circ) - \cos(-60^\circ)}{\sin^2(135^\circ)}$ (3 marks)

b) $\cos^2(-150^\circ) - 4\sin(390^\circ) + \cos(-60^\circ)$ (2 marks)

c) $\frac{\sin^2(60^\circ) + \cos(210^\circ)\sin(225^\circ)}{\sin(210^\circ) + \cos(360^\circ)}$ (3 marks)

d) $\sin^2(-210^\circ) + \left[\frac{\sin(-30^\circ)}{\cos(150^\circ)} \right]^2$ (2 marks)

2. Consider the graph of $y = 10\sin(x) + 5$.

For the extent of the graph, estimate the solutions to the following equations:

$$10\sin(x) + 5 = 0$$

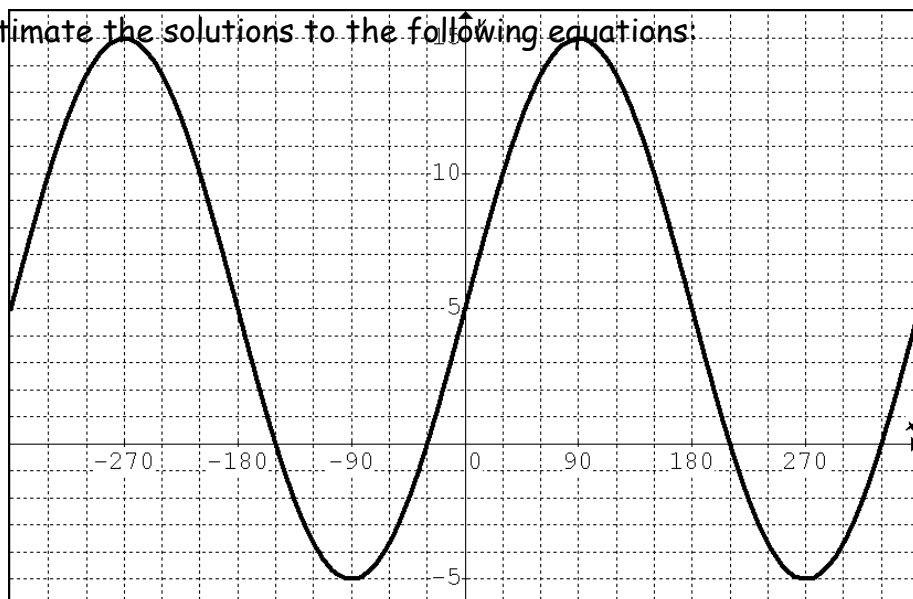
$$10\sin(x) + 5 = 5$$

$$10\sin(x) + 5 = 10$$

$$10\sin(x) + 5 = -5$$

$$10\sin(x) + 5 = 15$$

$$10\sin(x) + 5 = 12$$



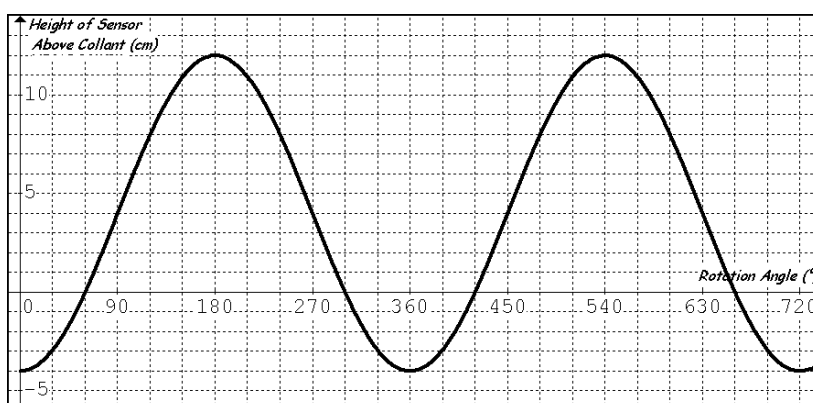
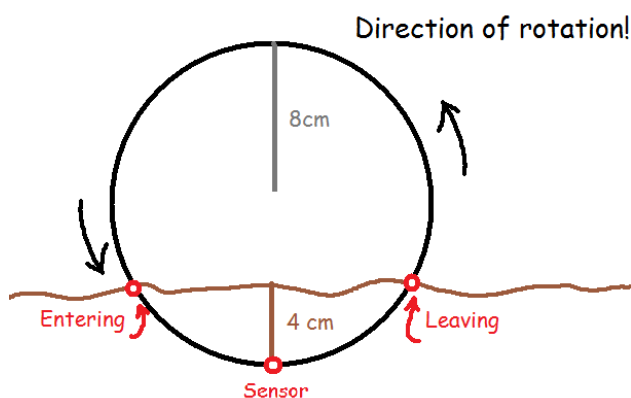
3. Solve the following trigonometric equations for all possible values of x .

a) $2\cos(x) - \sqrt{3} = 0$ (2 marks)

b) $\sqrt{2}\sin(x) + 1 = 0$ (2 marks)

c) $-3\cos(x) + 12 = 10$ (3 marks)

4. A drive shaft in a long liner is partially submerged in a coolant.



A sensor on the surface of the drive shaft sends a signal back to a computer every time it enters or leaves the coolant. This will allow the boat operator to monitor the status of the shaft and the coolant. The shaft starts to rotate when the sensor is at the very bottom giving us the equation $y = -8\cos(x) + 4$. Determine the angles of rotation for which the sensor will emit a signal. Indicate as many of these solutions as possible on the graph above. (7 marks)