

**MATH 155****EXAM 3 - Sample**

[1] What is the period of  $f(x) = -3 \sin(2\pi x - 13)$ ?

- (a) 3                      (c)  $\frac{2\pi}{13}$                       (e) None of the above  
(b)  $\frac{13}{2\pi}$                       (d) 1

[2] What is the phase shift of  $f(x) = -3 \sin(2\pi x - 13)$ ?

- (a) 3                      (c)  $\frac{2\pi}{13}$                       (e) None of the above  
(b)  $\frac{13}{2\pi}$                       (d) 1

[3] What is the amplitude of  $f(x) = -3 \sin(2\pi x - 13)$ ?

- (a) 3                      (c)  $\frac{2\pi}{13}$                       (e) None of the above  
(b)  $\frac{2}{13}$                       (d) 1

[4] Simplify and evaluate  $\cos\left(\frac{3\pi}{14}\right)\cos\left(\frac{2\pi}{7}\right) - \sin\left(\frac{3\pi}{14}\right)\sin\left(\frac{2\pi}{7}\right)$

- (a) 1                      (c)  $\frac{\sqrt{2}}{2}$                       (e) None of the above  
(b)  $\frac{\sqrt{3}}{2}$                       (d)  $\frac{1}{2}$

For the next two problems:

$$\sin \alpha = \frac{1}{3} \text{ with } \frac{\pi}{2} < \alpha < \pi \quad \text{and} \quad \sin \beta = -\frac{2}{7} \text{ with } \pi < \beta < \frac{3\pi}{2}$$

[5] Find the exact value of  $\cos(\alpha + \beta)$ :

- (a)  $\frac{3\sqrt{40} - 2}{21}$                       (c)  $\frac{-3\sqrt{40} + 2}{21}$                       (e) None of the above  
(b)  $\frac{-3\sqrt{5} - 4\sqrt{2}}{21}$                       (d)  $\frac{-3\sqrt{5} + 4\sqrt{2}}{21}$

[6] Find the exact value of  $\sin(\alpha + \beta)$  :

- (a)  $\frac{3\sqrt{40} - 2}{21}$                       (c)  $\frac{3\sqrt{40} + 2}{21}$                       (e) None of the above  
(b)  $\frac{-3\sqrt{5} - 4\sqrt{2}}{21}$                       (d)  $\frac{-3\sqrt{5} + 4\sqrt{2}}{21}$

[7] Find the exact value of  $\cos(165^\circ)$

- (a)  $\frac{\sqrt{2 + \sqrt{3}}}{2}$                       (c)  $\frac{\sqrt{2 - \sqrt{3}}}{2}$                       (e) None of the above  
(b)  $-\frac{\sqrt{2 + \sqrt{3}}}{2}$                       (d)  $\frac{\sqrt{2 + \sqrt{2}}}{2}$

[8] Solve  $\sin(x) \cos(x) = -\frac{\sqrt{2}}{4}$

- (a)  $x = -\frac{\pi}{8} + k\pi$  or  $-\frac{3\pi}{8} + k\pi$                       (d)  $x = \pm\frac{\pi}{8} + 2k\pi$   
(b)  $x = \frac{\pi}{4}$                       (e) None of the above  
(c)  $x = \frac{\pi}{8} + k\pi$  or  $\frac{3\pi}{8} + k\pi$

[9] Find all angles  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  for which  $\sin(\theta) = \cos(\theta)$

- (a)  $\theta = 45^\circ$                       (c)  $\theta = 45^\circ$  or  $315^\circ$                       (e) None of the above  
(b)  $\theta = 45^\circ$  or  $135^\circ$                       (d)  $\theta = 45^\circ$  or  $225^\circ$

[10] Simplify  $\cos^{-1}(\cos(\frac{7\pi}{4}))$

- (a)  $\frac{\pi}{4}$                       (c)  $-\frac{\pi}{4}$                       (e) None of the above  
(b)  $\frac{7\pi}{4}$                       (d)  $\frac{3\pi}{4}$

[11] Simplify  $\cos(\cos^{-1}(\frac{7\pi}{40}))$

- (a)  $\frac{7\pi}{40}$                       (c)  $\frac{5\pi}{40}$                       (e) None of the above.  
(b)  $-\frac{7\pi}{40}$                       (d)  $\frac{25\pi}{40}$

[12] Solve  $\sin^2(\theta) - 3\sin(\theta) = -2$ .

- (a) Either  $\theta = \sin^{-1}(1)$  or  $\theta = \sin^{-1}(2)$                       (d)  $\theta = \frac{(2k+1)\pi}{2}$   
(b)  $\theta = \sin^{-1}(1)$                       (e) None of the above.  
(c)  $\theta = \frac{\pi}{2} + 2k\pi$

[13] I want to construct a triangle with sides of length  $a, b, c$  opposite angles  $\alpha, \beta, \gamma$  respectively. If I want  $a = 4, b = 5$  and  $c = 10$ :

- (a)  $\cos(\alpha) = \frac{4^2 + 5^2 + 10^2}{2 \cdot 5 \cdot 10}$       (d) There is such a triangle but  $\cos(\alpha)$  is not as above.
- (b)  $\cos(\alpha) = \frac{4^2 + 5^2 - 10^2}{2 \cdot 5 \cdot 10}$       (e) No such triangle is possible.
- (c)  $\cos(\alpha) = \frac{5^2 + 10^2 - 4^2}{2 \cdot 5 \cdot 10}$

[14] I want to construct a triangle with sides of length  $a, b, c$  opposite angles  $\alpha, \beta, \gamma$  respectively. If I want  $a = 2, b = 4$  and  $c = 5$ :

- (a)  $\cos(\alpha) = \frac{2^2 + 4^2 + 5^2}{2 \cdot 4 \cdot 5}$       (d) There is such a triangle but  $\cos(\alpha)$  is not as above.
- (b)  $\cos(\alpha) = \frac{2^2 + 4^2 - 5^2}{2 \cdot 4 \cdot 5}$       (e) No such triangle is possible.
- (c)  $\cos(\alpha) = \frac{4^2 + 5^2 - 2^2}{2 \cdot 4 \cdot 5}$

[15] I want to construct a triangle with sides of length  $a, b, c$  opposite angles  $\alpha, \beta, \gamma$  respectively. If I want  $\alpha = \sin^{-1}\left(\frac{1}{5}\right) \simeq 12^\circ, \beta = \sin^{-1}\left(\frac{1}{8}\right) \simeq 7^\circ$  and  $b = 10$ :

- (a)  $a = 16$       (d) There is such a triangle but  $a$  is not as above.
- (b)  $a = \frac{1}{16}$       (e) No such triangle is possible.
- (c)  $a = 20$

[16] I want to construct a triangle with sides of length  $a, b, c$  opposite angles  $\alpha, \beta, \gamma$  respectively. If I want  $b = 5, a = 14$  and  $\beta = \sin^{-1}(\frac{1}{7})$ , necessarily:

(a)  $\alpha + \beta = \sin^{-1}(\frac{2}{5}) + \sin^{-1}(\frac{1}{7}) \simeq .2\pi$

(b)  $\alpha + \beta = \pi - \sin^{-1}(\frac{1}{7}) + \sin^{-1}(\frac{2}{5}) \simeq 1.1\pi$

(c) Either  $\alpha + \beta = \sin^{-1}(\frac{2}{5}) + \sin^{-1}(\frac{1}{7}) \simeq .2\pi$  or  $\alpha + \beta = \pi - \sin^{-1}(\frac{2}{5}) + \sin^{-1}(\frac{1}{7}) \simeq .9\pi$

(d) There is such a triangle but  $\alpha + \beta$  is not as above.

(e) No such triangle is possible.

[17] Convert polar coordinates of  $(6, -\frac{\pi}{6})$  to rectangular coordinates:

(a)  $(3\sqrt{3}, 3)$

(d)  $(3\sqrt{3}, -3)$

(b)  $(6, 3\sqrt{3})$

(e) None of the above.

(c)  $(3, 3\sqrt{2})$

[18] What is the area of the triangle with sides  $a = 4, b = 5$  and included angle  $\theta = \frac{\pi}{6}$ ?

(a) 40

(d) 5

(b) 20

(e) None of the above.

(c) 10

[19] Convert rectangular coordinates of  $(-3\sqrt{2}, -3\sqrt{2})$  to polar coordinates:

- (a) The only possible polar coordinates are  $(6, -\frac{\pi}{4})$
- (b) The only possible polar coordinates are  $(6\sqrt{2}, -\frac{\pi}{4})$
- (c) Possible polar coordinates are  $(6, -\frac{3\pi}{4})$  and  $(-6, \frac{\pi}{4})$
- (d) Possible polar coordinates are  $(6\sqrt{2}, -\frac{\pi}{4})$  and  $(-6\sqrt{2}, -\frac{3\pi}{4})$
- (e) None of the above.

[20] In the following graph of  $y = \tan(x)$  the point  $Q$  has coordinates:

- (a)  $(-\frac{\pi}{2}, 0)$
- (b)  $(-\pi, 0)$
- (c)  $(-\frac{3\pi}{2}, 0)$
- (d)  $(-\frac{7\pi}{2}, 0)$
- (e)  $(-3\pi, 0)$

