MATH 155

EXAM 3 -FORM A

Name: ___________  Section: ___________  Zid: ___________

Directions: Complete the information above; then, on the answer sheet, fill in the following in the appropriate spaces and darken the corresponding ovals:

1. Last name, first and middle initials.

2. Student Z Number. (LEFT-justify the 6 digits in the ID field leaving the last 3 spaces blank.)

3. Section:

A1=11  A2=12  A3=13
A4=14  A5=15  A6=16
B1=21  B2=22  B3=23
C1=31  C2=32  C3=33
D1=41  D2=42  D3=43

4. Your signature on the back.

5. No Scratch paper outside of the Exam is permitted.

6. Only a basic non-text capable, non-graphing calculator is permitted.

7. Graphing calculators, cell phones and pdas shall be stowed out of sight. IF VISIBLE YOU WILL BE DEEMED TO BE CHEATING AND WILL RECEIVE A ZERO SCORE FOR THE EXAM!!!

8. Check that your exam contains exactly 20 problems. Each problem is worth 5 points.

[1A] What is the area of the triangle with sides \( a = 8 \), \( b = 10 \) and included angle \( \theta = \frac{\pi}{6} \)?

(a) 5  (d) 40
(b) 10  (e) None of the above.
(c) 20

[2A] Simplify and evaluate: \( \cos \left( \frac{5\pi}{12} \right) \cos \left( \frac{\pi}{4} \right) + \sin \left( \frac{5\pi}{12} \right) \sin \left( \frac{\pi}{4} \right) \)

(a) 0  (c) \( \frac{\sqrt{2}}{2} \)  (e) None of the above
(b) \( \frac{\sqrt{3}}{2} \)  (d) \( \frac{1}{2} \)
[3A] Solve $3 \sin(x) \cos(x) = -\frac{3\sqrt{2}}{4}$

(a) $x = -\frac{\pi}{8} + k\pi$ or $-\frac{3\pi}{8} + k\pi$

(b) $x = \frac{\pi}{4}$

(c) $x = \frac{\pi}{8} + k\pi$ or $\frac{3\pi}{8} + k\pi$

(d) $x = \pm \frac{\pi}{8} + 2k\pi$

(e) None of the above

For the next two problems:

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

[4A] Find the exact value of $\cos(\alpha - \beta)$:

(a) $\frac{3\sqrt{40} - 2}{21}$

(b) $\frac{-3\sqrt{5} - 4\sqrt{2}}{21}$

(c) $\frac{-3\sqrt{40} + 2}{21}$

(d) $\frac{-3\sqrt{5} + 4\sqrt{2}}{21}$

(e) None of the above

[5A] Find the exact value of $\sin(\alpha - \beta)$:

(a) $\frac{3\sqrt{40} - 2}{21}$

(b) $\frac{-3\sqrt{5} - 4\sqrt{2}}{21}$

(c) $\frac{3\sqrt{40} + 2}{21}$

(d) $\frac{-3\sqrt{5} + 4\sqrt{2}}{21}$

(e) None of the above

[6A] Find the exact value of $\sin(165^\circ)$

(a) $\frac{\sqrt{2} - \sqrt{3}}{2}$

(b) $\frac{\sqrt{6} - \sqrt{2}}{4}$

(c) $\frac{\sqrt{6} + \sqrt{2}}{4}$

(d) $\frac{\sqrt{2} + \sqrt{3}}{2}$

(e) $-\frac{\sqrt{2} + \sqrt{3}}{2}$

[7A] Find all angles $\theta$ in the range $0^\circ \leq \theta \leq 360^\circ$ for which $\sin(-\theta) = -\cos(-\theta)$

(a) $\theta = 45^\circ$

(b) $\theta = 45^\circ$ or $135^\circ$

(c) $\theta = 45^\circ$ or $315^\circ$

(d) $\theta = 45^\circ$ or $225^\circ$

(e) None of the above
[8A] Solve $\sin^2(\theta) = -2 - 3\sin(\theta)$.

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

[9A] I want to construct a triangle with sides of length $a, b, c$ opposite angles $A, B, C$ respectively. If I want $a = 4$, $b = 5$ and $c = 8$:

  (a) $\cos(A) = \frac{4^2 + 5^2 + 8^2}{2 \cdot 5 \cdot 8}$
  (b) $\cos(A) = \frac{4^2 + 5^2 - 8^2}{2 \cdot 5 \cdot 8}$
  (c) $\cos(A) = \frac{5^2 + 8^2 - 4^2}{2 \cdot 5 \cdot 8}$
  (d) There is such a triangle but $\cos(A)$ is not as above.
  (e) No such triangle is possible.

[10A] I want to construct a triangle with sides of length $a, b, c$ opposite angles $A, B, C$ respectively. If I want $a = 2$, $b = 4$ and $c = 8$:

  (a) $\cos(A) = \frac{2^2 + 4^2 + 8^2}{2 \cdot 4 \cdot 8}$
  (b) $\cos(A) = \frac{2^2 + 4^2 - 8^2}{2 \cdot 4 \cdot 8}$
  (c) $\cos(A) = \frac{4^2 + 8^2 - 2^2}{2 \cdot 4 \cdot 8}$
  (d) There is such a triangle but $\cos(\alpha)$ is not as above.
  (e) No such triangle is possible.

[11A] I want to construct a triangle with sides of length $a, b, c$ opposite angles $A, B, C$ respectively. If I want $A = \sin^{-1}\left(\frac{2}{5}\right)$, $B = \sin^{-1}\left(\frac{1}{8}\right)$ and $b = 10$:

  (a) $a = 32$
  (b) $a = \frac{1}{32}$
  (c) $a = 20$
  (d) There is such a triangle but $a$ is not as above.
  (e) No such triangle is possible.
[12A] I want to construct a triangle with sides of length $a, b, c$ opposite angles $A, B, C$ respectively. If I want $b = 10$, $a = 14$ and $B = \sin^{-1}(\frac{1}{7})$, necessarily:

(a) $A = \sin^{-1}(\frac{1}{5})$

(b) $A = \pi - \sin^{-1}(\frac{1}{5})$

(c) Either $A = \sin^{-1}(\frac{1}{5})$ or $A = \pi - \sin^{-1}(\frac{1}{5})$

(d) There is such a triangle but $A$ is not as above.

(e) No such triangle is possible.

[13A] I want to construct a triangle with sides of length $a, b, c$ opposite angles $A, B, C$ respectively. If I want $b = 1$, $a = 14$ and $B = \sin^{-1}(\frac{1}{7})$, necessarily:

(a) $A = \sin^{-1}(2)$

(b) $A = \pi - \sin^{-1}(2)$

(c) Either $A = \sin^{-1}(2)$ or $A = \pi - \sin^{-1}(2)$

(d) There is such a triangle but $A$ is not as above.

(e) No such triangle is possible.

[14A] I want to construct a triangle with sides of length $a, b, c$ opposite angles $A, B, C$ respectively. If I want $b = 15$, $a = 14$ and $B = \sin^{-1}(\frac{1}{3})$, necessarily:

(a) $A = \sin^{-1}(\frac{1}{3})$

(b) $A = \pi - \sin^{-1}(\frac{1}{3})$

(c) Either $A = \sin^{-1}(\frac{1}{3})$ or $A = \pi - \sin^{-1}(\frac{1}{3})$

(d) There is such a triangle but $A$ is not as above.

(e) No such triangle is possible.

[15A] Convert polar coordinates of $(6, -\pi)$ to rectangular coordinates:

(a) $(0, -6)$

(b) $(6, 0)$

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

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

(e) None of the above.
16A] Convert rectangular coordinates of \((0, -3)\) to polar coordinates:

(a) The only possible polar coordinates are \((3, -\frac{\pi}{2})\)

(b) The only possible polar coordinates are \((-3, \frac{\pi}{2})\)

(c) Possible polar coordinates are \((3, \frac{3\pi}{2})\) and \((-3, \frac{\pi}{2})\)

(d) Possible polar coordinates are \((3, -\frac{3\pi}{2})\) and \((-3, \frac{3\pi}{2})\)

(e) None of the above.

17A] Which of the following is the polar graph of \(r = 2\)?

18A] Which of the following is the polar graph of \(\theta = -\frac{3\pi}{4}\)?
[19A] Simplify \( \frac{1}{\csc x} \left( \frac{1}{\sin x} - 2 \sin x \right) \)

(a) \( 2 \cos^2 x - 1 \) \hspace{1cm} (d) \( -\sin^2 x \)
(b) \( -\cos^2 x \) \hspace{1cm} (e) \( 1 \)
(c) \( 2 \sin^2 x - 1 \)

[20A] Which of the following are identities?
(I) \( \sin^2 t - \cos^2 t = 2 \sin^2 t - 1 \)
(II) \( \tan \beta \sin \beta = \sec \beta + \cos \beta \)
(III) \( \cos \theta \csc \theta \tan \theta = 1 \)

(a) I, II, III \hspace{1cm} (d) III only
(b) I only \hspace{1cm} (e) Some other selection.
(c) II only

[21A] Simplify \( \frac{\tan^2 \beta}{\sec \beta + 1} + \frac{\tan^2 \beta}{1 - \sec \beta} \)

(a) \( 2 \cos^2 \beta \) \hspace{1cm} (d) \( 2 \)
(b) \( 2 \sin^2 \beta \) \hspace{1cm} (e) None of the above.
(c) \(-2\)