MA 154   Exam 3   Spring 2008

This exam covers Section 7.4 starting with Question #35, and all of Sections 7.6, 8.1, 8.2, 8.3 and 8.4

1.   Given $a = \langle 4,5 \rangle$ and $b = \langle -7,8 \rangle$ find $3a - 2b$

   A. $\langle 2,5 \rangle$

   B. $\langle -22,-5 \rangle$

   C. $\langle -2,31 \rangle$

   D. $\langle 26,-1 \rangle$

   E.   None of the above

2.   Determine the value of m such that the two vectors are orthogonal.

$$a = 2mi + 8j \text{ and } b = 16i - 5j$$

   A. -1.25

   B. 5

   C. 1.25

   D. -5

   E.   None of the above.

3.   Approximate the solutions to four decimal places in the interval $[0, \pi)$.

$$10\cos^2 x - 4\cos x - 5 = 0$$

   A. $0.3630, 2.1351$

   B. $0.9348, -0.5348$

   C. $1.0065, 2.7786$

   D. $0.6848, -0.8002$

   E.   None of the above

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4.   If a projectile is fired from ground level with an initial velocity $v\ ft/sec$ and at an angle of θ degrees with the horizontal, the range R of the projectile is given by:

$$R = \frac{v^2}{16}\sin\theta\cos\theta$$

If $v = 92\ ft/sec$, approximate the angles, to the nearest tenth of a degree, that result in a range of $162\ feet$.

     A. $19.7°, 70.3°$

     B. $18.9°, 71.1°$

     C. $20.1°, 69.9°$

     D. $21.2°, 68.8°$

     E.   None of the above.

5.   Find the solutions of the equation that are in the interval $[0, 2\pi)$.

$$\sin(2t) + \sin(t) = 0$$

     A. $0, \pi, \dfrac{\pi}{3}, \dfrac{5\pi}{3}$

     B. $\dfrac{\pi}{2}, \dfrac{3\pi}{2}, \dfrac{2\pi}{3}, \dfrac{4\pi}{3}$

     C. $0, \pi, \dfrac{2\pi}{3}, \dfrac{4\pi}{3}$

     D. $\dfrac{\pi}{2}, \dfrac{3\pi}{2}, \dfrac{\pi}{3}, \dfrac{5\pi}{3}$

     E.   None of the above.

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6.   Find the exact value of the expression.

$$\cos^{-1}\left[\cos\left(-\frac{\pi}{3}\right)\right]$$

A. $\dfrac{\pi}{3}$

B. $\dfrac{2\pi}{3}$

C. $\dfrac{4\pi}{3}$

D. $-\dfrac{\pi}{3}$

E.   None of the above.

7.   Write the expression as an algebraic expression in x for $x > 0$.

$$\sin\left[2\tan^{-1}\left(\frac{x}{3}\right)\right]$$

A. $\dfrac{6x}{x^2+6x+9}$

B. $\dfrac{6x-2x^2}{3}$

C. $\dfrac{2x\sqrt{9-x^2}}{9}$

D. $\dfrac{6x}{9+x^2}$

E.   None of the above.

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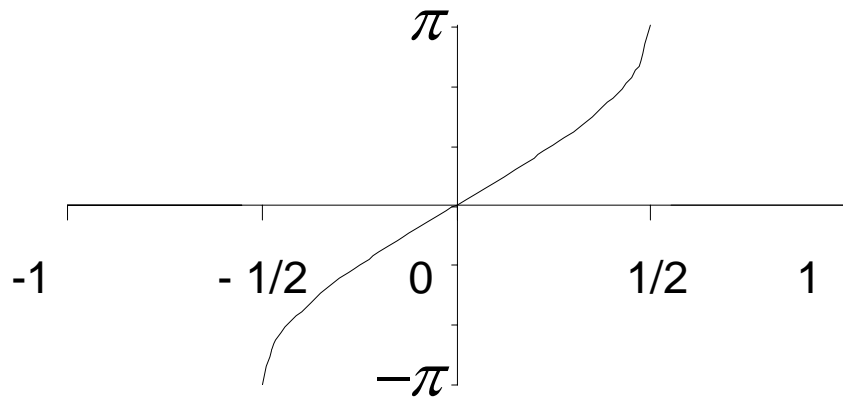8.　　Which of the following equations most closely resembles the graph of the function?

A.　$y = \sin^{-1}(x)$

B.　$y = \dfrac{1}{2}\sin^{-1}(2x)$

C.　$y = 2\sin^{-1}\left(\dfrac{x}{2}\right)$

D.　$y = \dfrac{1}{2}\sin^{-1}\left(\dfrac{x}{2}\right)$

E.　$y = 2\sin^{-1}(2x)$

π

-1　　　- 1/2　　0　　　1/2　　1

$-\pi$

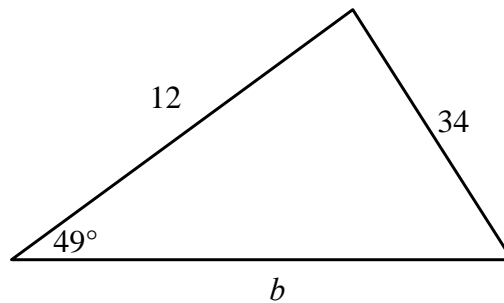9.　　Which of the following best describes the length of side b?

A.　Between 40 and 41

B.　Between 39 and 40

C.　Between 38 and 39

D.　Between 41 and 42

E.　None of the above

12

34

49°

b

10.　Find the smallest positive angle between vectors $\langle -3, -8 \rangle$ and $\langle -7, 12 \rangle$, to the nearest whole degree.

A.　51°

B.　120º

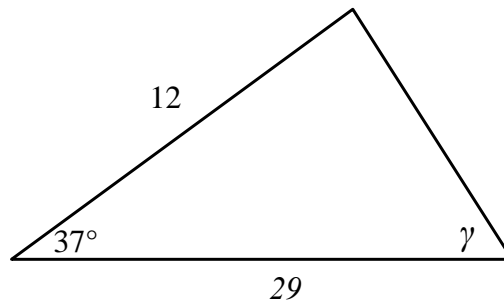C.　60º

D.　129º

E.　None of the above

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11.   From point P along a level path the angle of elevation of the top of a tree is $34°$.
       From a point 50 meters closer to the tree, and along a line connecting the base of
       the tree and point P, the angle of elevation of the top of the same tree is $49°$.
       What is the height of the tree to the nearest tenth of a meter?

       A.   60.4 meters

       B.   81.5 meters

       C.   89. 6 meters

       D.   73.8 meters

       E.   None of the above

12.   Which of the following best describes the measure of angle γ?

       A.   Between $80°$ and $81°$

       B.   Between $24°$ and $25°$

       C.   Between $20°$ and $21°$

       D.   Between $84°$ and $85°$

       E.   Between $42°$ and $43°$

13.   Which of the following is a **unit** vector in the **opposite direction** as $a = -5i + 12j$.

       A. $-5i + 12j$

       B. $\dfrac{5}{13}i - \dfrac{12}{13}j$

       C. $5i - 12j$

       D. $-\dfrac{5}{13}i + \dfrac{12}{13}j$

       E.   None of the above

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14. **Distance between automobiles.** Two automobiles leave a city at the same time and travel along straight highways that differ in direction by 80°. If their speeds are 60 mi/hr and 45 mi/hr, respectively, approximately, to the nearest tenth of a mile, how far apart are the cars at the end of 25 minutes?

    A.   34.5 miles

    B.   68.5 miles

    C.   36.5 miles

    D.   48.5 miles

    E.   None of the above

15. An airplane, with airspeed of 200 miles per hour, is flying in the direction 60° and a 55 mile per hour wind is blowing directly from the west. What is the ground speed of the airplane rounded to the nearest mile per hour?

    A.   249 mph

    B.   154 mph

    C.   232 mph

    D.   179 mph

    E.   None of the above

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Exam 3 Answers

Question	Answer	Form A Green
1.	$\langle 26, -1 \rangle$	D
2.	1.25	C
3.	$0.3630, 2.1351$	A
4.	$18.9°, 71.1°$	B
5.	$0, \pi, \dfrac{2\pi}{3}, \dfrac{4\pi}{3}$	C
6.	$\dfrac{\pi}{3}$	A
7.	$\dfrac{6x}{9 + x^2}$	D
8.	$y = 2\sin^{-1}(2x)$	E
9.	$b=40.6$	A
10.	$129°$	D
11.	81.5 meters	B
12.	20.4	C
13.	$\dfrac{5}{13}i - \dfrac{12}{13}j$	B
14.	28.5 miles	E
15.	249 mph	A