# MA 15400 Exam 3 Spring 2010

Covers all of Section 7.6, 8.1, 8.2, 8.3, 8.4, and all of 4.5

1. Find the exact value of the expression.

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

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

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

C. $\frac{-\pi}{3}$

D. $\frac{4\pi}{3}$

E. None of the above

2. Approximate the solutions of the equation, to four decimals, in the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$.

$$5\sin^2 x - \sin x - 2 = 0$$

A. $-0.7373,\ 0.9633$

B. $-0.5708,\ 0.8335$

C. $-0.4820,\ 1.4245$

D. $-0.5403,\ 0.7403$

E. None of the above

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3. Find the exact value of the expression.

$$\cos\left[2\sin^{-1}\left(\frac{x}{5}\right)\right]$$

A. $\frac{10x-2x^2}{25}$

B. $\frac{5-2x}{5}$

C. $\frac{2x\sqrt{25-x^2}}{25}$

D. $\frac{25-2x^2}{25}$

E. None of the above

4. There are two distinct triangles possible with a side *a* = 12.0 *cm*, side *b* = 17.0 *cm*, and angle $\alpha = 38°$. Find the perimeter of both triangles to the nearest tenth of a *cm*.

A. $50.0\,cm, 39.6\,cm$

B. $52.7\,cm, 44.8\,cm$

C. $48.3\,cm, 36.5\,cm$

D. $49.1\,cm, 37.4\,cm$

E. None of the above

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5. **Height of a hot-air balloon.** The angles of elevation of a balloon from two points A and B on level ground are $A = 22°20'$ and $B = 41°20'$, respectively. The points A and B are 8.8 miles apart and the balloon is between the points, in the same vertical plane. Approximate, to the nearest tenth, the height of the balloon above the ground.

A. $2.5\,miles$

B. $3.1\,miles$

C. $3.3\,miles$

D. $2.7\,miles$

E. None of the above

6. The lengths of the sides of a triangle are 20, 21, and 31. To the nearest degree, find the measure of the largest angle in the triangle.

A. $82°$

B. $102°$

C. $98°$

D. $78°$

E. None of the above

7. **Distance between ships.** A ship leaves port at 1:40 p.m. and travels S33°E at the rate of 24 mi/hr. Another ship leaves the same port at 1:40 p.m. and travels S20°W at 9 mi/hr. Approximate, to the nearest tenth of a mile, how far apart the ships are at 3:00 p.m.?

A. $27.5\,miles$

B. $26.6\,miles$

C. $28.3\,miles$

D. $29.4\,miles$

E. None of the above

8. Given vectors $a = -2i + 5j$ and $b = 3i - j$, find $4a + 5b$

A. $6i + 14j$

B. $4i + 20j$

C. $5i + 25j$

D. $8i + 12j$

E. None of the above

9. Find the vector that has 5 times the magnitude and is in the same direction as $\langle 5, -12 \rangle$.

A. $\langle 25, -60 \rangle$

B. $\left\langle \frac{25}{13}, \frac{-60}{13} \right\rangle$

C. $\left\langle \frac{5}{13}, \frac{-12}{13} \right\rangle$

D. $\left\langle 1, \frac{-12}{5} \right\rangle$

E. None of the above

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10. The magnitudes and directions of two forces acting at a point P are given in (a) and (b). Approximate, to the nearest tenth, the magnitude of the resultant vector.

(a) 5.5 kg, 111° (b) 2.7 kg, 210°

A. $6.5\,kg$

B. $6.1\,kg$

C. $5.3\,kg$

D. $5.7\,kg$

E. None of the above

11. An airplane with airspeed of 350 mi/hr is flying in the direction 76°, and a 50 mi/hr wind is blowing in the direction of 100°. Approximate, to the nearest degree, the plane's true course.

A. 81°

B. 79°

C. 82°

D. 78°

E. None of the above

12. Determine $m$ such that the two vectors are orthogonal.

$$a = 3mi + 4j,\ b = i + 9j$$

A. $m = -12$

B. $m = \frac{3}{4}$

C. $m = 12$

D. $m = \frac{-3}{4}$

E. None of the above

13. Find a function in $x$ that satisfies the following conditions.

| |
|---|
| Vertical asymptotes: $x = 2, x = -4$<br>Horizontal Asymptote: $y = 0$<br>$x$-intercept: $-5$, $f(1) = 12$ |

A. $f(x) = \frac{-27(x+5)}{(x-2)(x+4)}$

B. $f(x) = \frac{10(x-5)}{(x+2)(x-4)}$

C. $f(x) = \frac{27(x-5)}{(x+2)(x-4)}$

D. $f(x) = \frac{-10(x+5)}{(x-2)(x+4)}$

E. None of the above

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For Questions 14 and 15, use the function: $f(x) = \dfrac{3x^2 + 4x}{x^2 + 2x - 15}$

14. What is the horizontal asymptote?

A. $y = 0$

B. $y = 3$

C. There is no horizontal asymptote

D. $y = \dfrac{-4}{15}$

E. None of the above

15. What are the vertical asymptotes?

A. $x = 5, x = -3$

B. $x = 0, x = \dfrac{-4}{3}$

C. $x = -5, x = 3$

D. $x = 0, x = \dfrac{4}{3}$

E. None of the above

Covers all of Section 7.6, 8.1, 8.2, 8.3, 8.4, and all of 4.5

# Exam 3 Answers

| Question | Answers | |
|---|---|---|
| 1. | $\frac{\pi}{3}$ | A |
| 2. | $-0.5708,\ 0.8335$ | B |
| 3. | $\frac{25-2x^2}{25}$ | D |
| 4. | $48.3\,cm, 36.5\,cm$ | C |
| 5. | $2.5\,miles$ | A |
| 6. | $98°$ | C |
| 7. | $26.6\,miles$ | B |
| 8. | $7i+15j$ | E |
| 9. | $\langle 25,-60\rangle$ | A |
| 10. | $5.7\,kg$ | D |
| 11. | $79°$ | B |
| 12. | $m=-12$ | A |
| 13. | $f(x)=\frac{-10(x+5)}{(x-2)(x+4)}$ | D |
| 14. | $y=3$ | B |
| 15. | $x=-5, x=3$ | C |