

MA 15400

Spring 2012

Exam 2

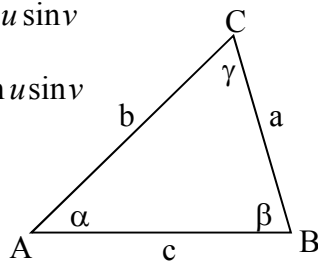
$$\sin(u + v) = \sin u \cos v + \cos u \sin v$$

$$\cos(u + v) = \cos u \cos v - \sin u \sin v$$

$$\tan(u + v) = \frac{\tan u + \tan v}{1 - \tan u \tan v}$$

$$\sin(2u) = 2 \sin u \cos u$$

$$\sin^2 \theta + \cos^2 \theta = 1$$



$$\cos(2u) = \cos^2 u - \sin^2 u$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$\sin(u - v) = \sin u \cos v - \cos u \sin v$$

$$\cos(u - v) = \cos u \cos v + \sin u \sin v$$

$$\tan(u - v) = \frac{\tan u - \tan v}{1 + \tan u \tan v}$$

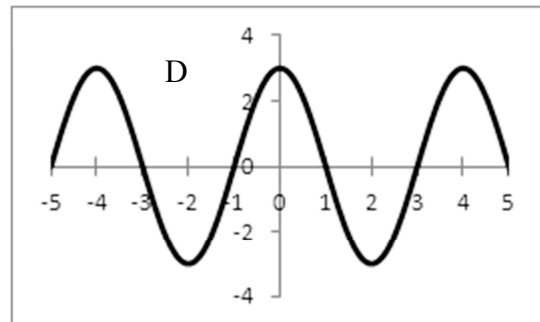
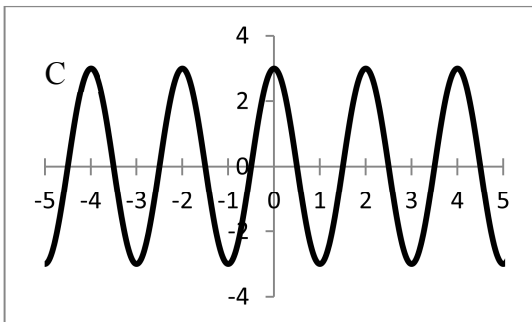
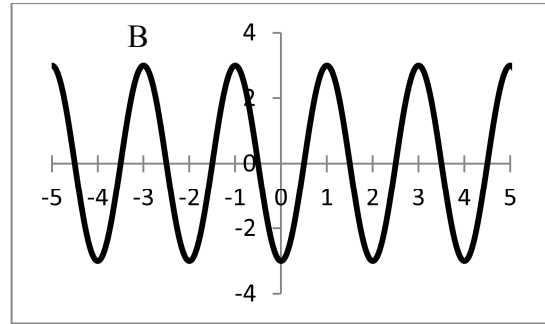
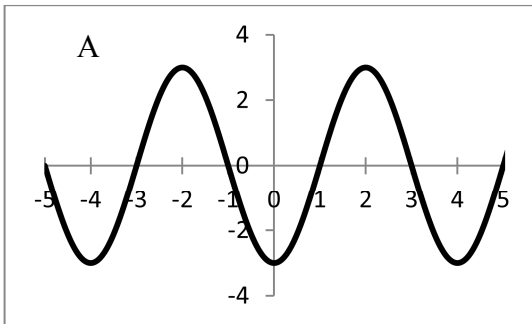
$$\tan(2u) = \frac{2 \tan u}{1 - \tan^2 u}$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

1. Find the Period and Phase Shift of the equation $y = \sin\left(\frac{1}{2}x - \frac{\pi}{3}\right)$.

- A. Period = 4π , Phase Shift = $\frac{\pi}{6}$
B. Period = 4π , Phase Shift = $\frac{2\pi}{3}$
C. Period = π , Phase Shift = $\frac{\pi}{6}$
D. Period = π , Phase Shift = $\frac{2\pi}{3}$
E. None of the above

2. Which of the following graphs best represents the equation $y = 3\sin\left(\frac{\pi}{2}x + \frac{\pi}{2}\right)$?



Covers Lessons 10-19, Sections 6.5, 6.7, 7.2, 7.3 and 7.4 up to question #25

3. Scientists sometimes use the formula $f(t) = a \sin(bt + c) + d$ to simulate temperature variations during the days, with time t in hours, temperature $f(t)$ in $^{\circ}\text{C}$, and $t = 0$ corresponding to midnight. Assume that $f(t)$ is decreasing at midnight.

On a winter day last year, the high temperature was 10°C , and the low of temperature of 4°C occurred at 3 am. Which of the following statements best describes the temperature at noon ($t = 12$)?

A. Between 7°C and 10°C and rising

B. Between 3°C and 7°C and falling

C. Between 3°C and 7°C and rising

D. Between 7°C and 10°C and falling

E. None of the above.

4. A 30 foot ladder is leaning against the side of a building such that there is a 20° between the ladder and the building. If the bottom of the ladder is moved three feet **closer** to the base of the building, what angle will the ladder now make with the building? Please round to the nearest tenth of a degree.

A. 15.6°

B. 14.0°

C. 16.2°

D. 14.8°

E. None of the above

Covers Lessons 10-19, Sections 6.5, 6.7, 7.2, 7.3 and 7.4 up to question #25

For questions 5 and 6: An airplane, flying at a speed of 400 miles per hour, flies in the direction of 150° for 2 hours and then flies in the direction 60° for one hour.

5. Approximate, to the nearest mile, how far the plane is from point A.

- A. 953 miles
- B. 862 miles
- C. 916 miles
- D. 894 miles
- E. None of the above

6. Approximate, to the nearest degree, what direction the plane needs to fly in order to return to point A.

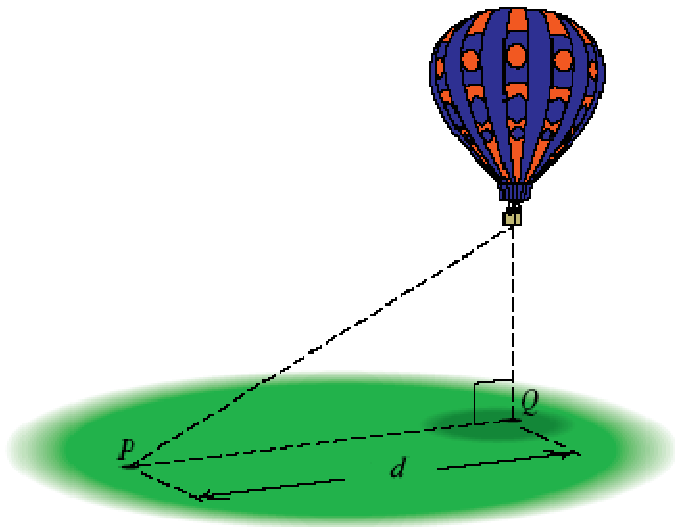
- A. 303°
- B. 311°
- C. 287°
- D. 295°
- E. None of the above

Covers Lessons 10-19, Sections 6.5, 6.7, 7.2, 7.3 and 7.4 up to question #25

7. Given $\triangle ABC$ with $\gamma = 90^\circ$, express side c in terms of angle β and side a .

- A. $c = a \tan \beta$
- B. $c = a \csc \beta$
- C. $c = a \sin \beta$
- D. $c = a \sec \beta$
- E. $c = a \cos \beta$

8. As a hot-air balloon rises vertically, its angle of elevation from a point P on level ground $d = 200$ kilometers from the point Q directly underneath the balloon changes from 19° to 30° (see the figure). Approximately how far does the balloon rise during this period? (Give the answer to one decimal place.)



- A. 34.9 km
- B. 38.2 km
- C. 46.6 km
- D. 41.7 km
- E. None of the above

Covers Lessons 10-19, Sections 6.5, 6.7, 7.2, 7.3 and 7.4 up to question #25

9. Find all solutions of the equation using n as an arbitrary integer.

$$\tan(\theta) = \sqrt{3}$$

A. $\theta = \frac{\pi}{4} + \pi n$

B. $\theta = \frac{\pi}{6} + \pi n$

C. $\theta = \frac{2\pi}{3} + \pi n$

D. $\theta = \frac{5\pi}{6} + \pi n$

E. None of the above

10. Find all solutions of the equation using n as an arbitrary integer.

$$\cos\left(2\phi - \frac{\pi}{4}\right) = 0$$

A. $\phi = \frac{\pi}{8} + \pi n$

B. $\phi = \frac{3\pi}{8} + \frac{\pi}{2} n$

C. $\phi = \frac{\pi}{8} + \frac{\pi}{2} n$

D. $\phi = \frac{3\pi}{8} + \pi n$

E. None of the above

Covers Lessons 10-19, Sections 6.5, 6.7, 7.2, 7.3 and 7.4 up to question #25

11. Find all solutions of the equation in the interval $[0, 2\pi)$.

$$\tan\left(2\mu - \frac{\pi}{2}\right) = 1$$

- A. $\mu = \frac{\pi}{3}, \frac{5\pi}{6}, \frac{4\pi}{3}, \frac{11\pi}{6}$
- B. $\mu = \frac{\pi}{3}, \frac{4\pi}{3}$
- C. $\mu = \frac{3\pi}{8}, \frac{7\pi}{8}, \frac{11\pi}{8}, \frac{15\pi}{8}$
- D. $\mu = \frac{3\pi}{8}, \frac{11\pi}{8}$
- E. None of the above

12. Express as a trigonometric function of one angle.

$$\sin(54^\circ)\cos(14^\circ) - \cos(54^\circ)\sin(14^\circ)$$

- A. $\sin(40^\circ)$
- B. $\cos(40^\circ)$
- C. $\sin(68^\circ)$
- D. $\cos(68^\circ)$
- E. None of the above

13. Given $\triangle ABC$ with $\gamma = 90^\circ$, $a = 12$, and $b = 8$, approximate angle α to the nearest tenth of a degree.

- A. $\alpha = 33.7^\circ$
- B. $\alpha = 41.8^\circ$
- C. $\alpha = 56.3^\circ$
- D. $\alpha = 48.2^\circ$
- E. None of the above

Covers Lessons 10-19, Sections 6.5, 6.7, 7.2, 7.3 and 7.4 up to question #25

14. If $\sin \alpha = \frac{3}{5}$ and $\tan \beta = \frac{-6}{7}$ for a second-quadrant angles α and β , then find the exact value of $\cos(\alpha + \beta)$.

A. $\frac{15}{5\sqrt{85}}$

B. $\frac{2}{\sqrt{85}}$

C. $\frac{36}{5\sqrt{85}}$

D. $\frac{-15}{5\sqrt{85}}$

E. $\frac{-2}{\sqrt{85}}$

15. Find the exact value of $\sin(2\theta)$ if $\cos \theta = \frac{-7}{8}$ and $180^\circ < \theta < 270^\circ$.

A. $\frac{-17}{32}$

B. $\frac{17}{32}$

C. $\frac{-7\sqrt{15}}{32}$

D. $\frac{7\sqrt{15}}{32}$

E. None of the above

Question	Letter	Answer
1.	B	Period = 4π , Phase Shift = $\frac{2\pi}{3}$
2.	D	See Exam
3.	A	Between 7°C and 10°C and rising
4.	B	14.0°
5.	D	894 miles
6.	A	303°
7.	D	$c = a \sec \beta$
8.	C	46.6 km
9.	E	$\theta = \frac{\pi}{3} + \pi n$ (<i>none of the above</i>)
10.	B	$\phi = \frac{3\pi}{8} + \frac{\pi}{2}n$
11.	C	$\mu = \frac{3\pi}{8}, \frac{7\pi}{8}, \frac{11\pi}{8}, \frac{15\pi}{8}$
12.	A	$\sin(40^{\circ})$
13.	C	$\alpha = 56.3^{\circ}$
14.	B	$\frac{2}{\sqrt{85}}$
15.	D	$\frac{7\sqrt{15}}{32}$