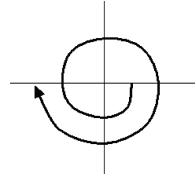


NOTICE: Course topics change slightly from one semester to the next, so students should always consult with their instructor.

There are 20 problems in Part I, each worth 3 points. No partial credit will be given, so be careful.

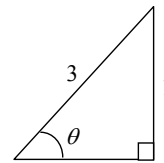
1. (30) Give the measure (in radians) of the following angle:

a. 3π b. π c. $-\pi$ d. -3π



2. Find the exact value of $\sin(90^\circ - \theta)$ for:

a. $\frac{1}{3}$ b. $\frac{\sqrt{8}}{3}$ c. $\frac{\sqrt{10}}{3}$ d. 3



3. Convert $\pi/5$ radians to degrees.

a. 36° b. 40° c. 72° d. $5/\pi^\circ$

4. Find the exact value of $\cos(7\pi/6)$

a. $\frac{\sqrt{3}}{2}$ b. $\frac{1}{2}$ c. $-\frac{1}{2}$ d. $-\frac{\sqrt{3}}{2}$

5. Find the exact value of $\cos(\tan^{-1} 3/4)$.

a. $\frac{4}{3}$ b. $\frac{4}{5}$ c. $\frac{5}{4}$ d. 7

6. Find the exact value of $2 \sin 15^\circ \cos 15^\circ$.

a. $\frac{1}{2}$ b. $-\frac{1}{\sqrt{3}}$ c. $\frac{\sqrt{3}}{4}$ d. $\frac{\sqrt{3}}{2}$

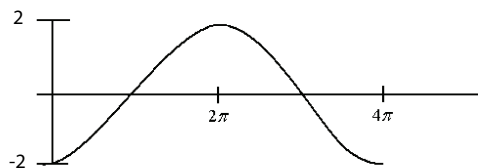
7. Find the range of $y = 3 \sin x$.

a. $[-3, 3]$ b. $[0, 6]$ c. $[0, 2\pi]$ d. $[-1, \frac{1}{3}]$

8. Find the period of $3 \sin(x/2)$.

a. 8π b. 4π c. 2π d. π

9. Give an equation for



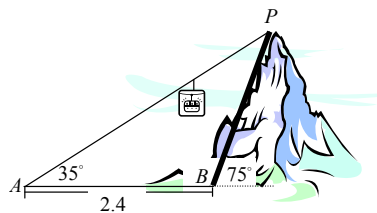
a. $y = 2 \cos(2x)$ b. $y = -2 \cos(x/2)$ c. $y = 4 \cos x$ d. $y = 2 \cos(x + \pi)$

10. Find all x , in the interval $0 \leq x < \pi$, that satisfy $\sec x = -2$.
a. $\frac{5\pi}{6}$ b. $\frac{3\pi}{4}$ c. $\frac{2\pi}{3}$ d. no solution
11. Find all x , in the interval $0 \leq x < \pi$, that satisfy $\cos x = 3$.
a. $\frac{1}{2}$ b. $\frac{\pi}{3}$ c. $\frac{3}{\pi}$ d. no solution
12. Find all x , in the interval $0 \leq x < \pi$, such that $\cot x$ is undefined.
a. 0 b. $\frac{\pi}{2}$ c. $\frac{2}{\pi}$ d. no solution
13. Find all x , in the interval $0 \leq x < \pi$, that satisfy $\sin(2x) = -1$.
a. $\frac{\pi}{4}$ b. $\frac{\pi}{2}$ c. $\frac{3\pi}{4}$ d. no solution
14. Give the rectangular coordinates of $(r, \theta) = (4, 7\pi/4)$.
a. $(-2\sqrt{2}, 2\sqrt{2})$ b. $(2\sqrt{2}, -2\sqrt{2})$ c. $(4, -\sqrt{2})$ d. $(-\sqrt{2}, -4)$
15. Which pair of polar coordinates does NOT represent the same point as $(2, \pi/2)$?
a. $(2, -3\pi/2)$ b. $(-2, 3\pi/2)$ c. $(2, -\pi/2)$ d. $(2, 5\pi/2)$
16. Find $(\cos 20^\circ + i \sin 20^\circ)^9$.
a. 9 b. $3 + 4i$ c. $2i$ d. -1
- For problems # 17 through # 19 use $v = 2\mathbf{i} + 3\mathbf{j}$ and $w = \mathbf{i} - 2\mathbf{j}$.
17. Compute $v - w$.
a. $3\mathbf{i} + \mathbf{j}$ b. $\mathbf{i} + 5\mathbf{j}$ c. $\mathbf{i} - 3\mathbf{j}$ d. -4
18. Compute $|v + w|$.
a. 12 b. $3\sqrt{2}$ c. $\sqrt{5} + \sqrt{13}$ d. $\sqrt{10}$
19. Compute $v \cdot w$.
a. 10 b. $8\mathbf{i}$ c. 2 d. -4
20. For every angle θ , $(1 - \sin \theta)^2 = \cos^2 \theta$.
a. TRUE b. FALSE

PART II

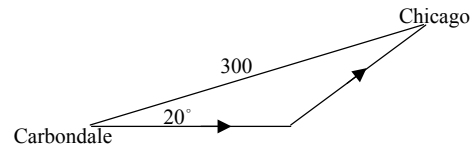
Here partial credit will be given. Show all of your work.

- [16] Find the exact value of the following.
(a) $\sin(5\pi/12)$ (b) $\tan(2\cos^{-1}(5/13))$
- [16] If $\cos\theta = 1/3$, where $3\pi/2 < \theta < 2\pi$, then find the exact value of the following.
(a) $\sin 2\theta$ (b) $\sin(\theta/2)$
- [14] Find the three cube roots of $-8i$ in $a + bi$ form.
- [12] Solve for θ , where $0 \leq \theta < 2\pi$: $2\sin^2\theta + \cos\theta - 1 = 0$.
- [10] Put $4x^2 + 16x - 3y^2 + 18y = 35$ into standard form by completing squares and then identify the conic as either a parabola, an ellipse or a hyperbola.
- [10] Solve the system of equations
$$\begin{aligned}x^2 + y^2 &= 4 \\2x - y &= 2.\end{aligned}$$
- [10] Consider $C : r = \frac{2}{3-10\cos\theta}$.
(a) Identify the graph of C as either a parabola, ellipse or a hyperbola.
(b) Find an equation in x, y that has the same graph as C .
- [20] As shown in the diagram, a cable car carries passengers from point A , which is 2.4 miles from point B at the base of the mountain, to a point P at the top of the mountain. The angles of elevation are shown.



- Find the distance between A and P .
- Find the height of the mountain.

9. [12] In attempting to fly from Carbondale to Chicago, a distance of 300 miles, a pilot takes a course that is 20° in error (see figure). After flying 15 minutes at 200 mph, the error is detected. How far must the pilot fly, once the course has been corrected, to reach Chicago?



10. [20] Verify the identities.

(a) $\cot \theta + \tan \theta = \csc \theta \sec \theta$

(b) $\sin(3\theta) = 3 \sin \theta - 4 \sin^3 \theta$