

Math 150 Exam 3 Review Problem Set

Note: This exam review does not cover every topic that could be covered on your exam.

Take a look at the previous Week in Reviews for more practice problems. This WIR is more heavily weighted on Sections 7.4-7.5 & 8.4-8.5 since there has not been a review on these sections yet.

(Problems 12 and 16 were taken or modified from *Precalculus* by Dugopolski.)

1. Evaluate the following.

(a) $\cos^{-1}\left(-\frac{1}{2}\right)$

(b) $\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

(c) $\tan^{-1}\left(\tan \frac{4\pi}{3}\right)$

(d) $\csc\left(\sec^{-1} \frac{9}{2}\right)$

(e) $\sec\left(2 \tan^{-1} \frac{1}{2}\right)$

2. Express $\sin(2 \cot^{-1} x)$ as an algebraic expression in x .

3. Find all solutions to the following trig equations.

(a) $2 \cos^2 u = 1 - \cos u$

(b) $3 \tan^3 x - 3 \tan^2 x - \tan x + 1 = 0$

(c) $\sin \frac{x}{5} = \frac{1}{\sqrt{2}}$

4. (i) Find all solutions to the equation. (ii) Find all solutions in the interval $[0, 2\pi)$.

$$\sin 100x \cos 96x - \cos 100x \sin 96x = -\frac{1}{2}$$

5. A vector \mathbf{u} has initial point $(-4, 3)$ and terminal point $(-1, -2)$, and $\mathbf{v} = \langle 7, 2 \rangle$.

(a) Calculate $\mathbf{u} + \mathbf{v}$

(b) Calculate $|\mathbf{v} - 2\mathbf{u}|$

(c) Calculate $\mathbf{u} \cdot \mathbf{v}$

(d) Find the angle between \mathbf{u} and \mathbf{v} to four decimal places.

(e) Find a unit vector that has the same direction as \mathbf{v} .

6. If $|\mathbf{v}| = 3$ and $\theta = 210^\circ$, what is the vector \mathbf{v} in component form?
7. Find the direction of the vector $\mathbf{u} = \langle -2, 5 \rangle$ to four decimal places.
8. A boat is traveling at 15 mi/hr with a bearing of S 30° W relative to the water. The water is flowing due north at 3 mi/hr.
- (a) What is the true velocity of the boat?
- (b) What are the true speed and bearing of the boat?

9. Let $\mathbf{u} = -9\mathbf{i} + 5\mathbf{j}$ and $\mathbf{v} = a\mathbf{i} - 6\mathbf{j}$. Find the value of a that would make these vectors orthogonal.
10. A telephone pole is anchored to the ground by 2 wires, one on each side. One wire has an angle of elevation of 40° . The other wire is 10 ft longer and has an angle of elevation of 35° . How tall is the pole?
11. Jack and Jill set sail from the same point. Jack travels in the direction $S 4^\circ E$ and Jill travels in the direction $S 9^\circ W$. After 4 hours, Jill is 4 miles due west of Jack. How far had Jill sailed?
12. Solve the following triangles.
- (a) $A = 60^\circ, b = 10, c = 12$

(b) $A = 24^\circ, a = 9, c = 18$

13. Suppose that $\sec x = \frac{4}{3}$ and that x is in Quadrant IV.

(a) Find all other trig values of x .

(b) Find all trig values of $2x$.

14. Verify the following identities:

$$(a) \frac{\frac{\sec x - \tan x}{\tan x - \sec x}}{\cot x} = \cos x$$

$$(b) \tan \frac{u}{2} \left(\csc \left(\frac{\pi}{2} - u \right) + 1 \right) = \tan u$$

19. If $\tan x = -\frac{\sqrt{7}}{3}$ and $270^\circ < x < 360^\circ$, find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$, and $\tan \frac{x}{2}$.

20. The wheel from “Wheel of Fortune” is spun while you are sitting on the edge. Suppose the wheel has a radius of 5 ft and is spinning at a rate of 20 rpm.

(a) What is the angular speed of the wheel?

(b) At what speed will you fly off the wheel if it stops suddenly?

(c) If one piece on the wheel subtends an angle of 10° , what is the area of this piece?