

MATH1060: Midterm 2 Practice Problems

The following are practice problems for the first exam.

1. Evaluate the following expressions:

- (a) $\arcsin \frac{\sqrt{3}}{2}$
- (b) $\cos^{-1}(0)$
- (c) $\sin^{-1} \frac{-1}{2}$
- (d) $\arctan \sqrt{3}$
- (e) $\arccos \frac{-\sqrt{2}}{2}$
- (f) $\tan^{-1}(-1)$

2. Sketch the graph of the following functions:

- (a) $y = \tan\left(\frac{x}{2}\right)$
- (b) $y = \csc(x)$
- (c) $y = \arctan(x)$
- (d) $y = \sin^{-1}(x)$

3. The sun is 20° above the horizon. If Mike is 6 feet tall, how long is his shadow?
4. An airplane is 200 miles north and 125 miles west of the airport. The pilot wants to fly directly to the airport. What bearing should be taken?
5. Determine the angle between the diagonal of a cube and its edge. (This is Exercise 44 from §4.8 in the textbook).
6. A car is moving at 60 miles per hour. Its wheel is rotating at 2 revolutions per second. What is the radius of its tire?
7. A satellite in a circular orbit 1250 km above earth makes one complete revolution every 110 minutes. If we assume that Earth is a sphere of radius 6378 km, what is the linear speed of the satellite?
8. Identify each of the following expressions as one of the standard trigonometric functions:

- (a) $\sec \beta \csc \beta - \cot \beta$
- (b) $\frac{\sin \gamma}{1 - \cos^2 \gamma}$

9. Simplify the following expressions:

- (a) $\sec^4 \alpha - \tan^4 \alpha$
- (b) $1 - 2 \cos^2 \delta + \cos^4 \delta$

(c) $\sin^2 \zeta + 3 \cos \zeta + 3$

(d) $\sin \epsilon \tan \epsilon + \cos \epsilon$

(e) $\sin \eta (\csc \eta - \sin \eta)$

(f) $\tan \iota - \frac{\sec^2 \iota}{\tan \iota}$

10. Rewrite the following expression so it is *not* in fractional form:

$$\frac{6}{\tan \kappa + \sec \kappa}$$

11. Use the trigonometric substitution $3x = 5 \tan \lambda$ to simplify the expression $\sqrt{9x^2 + 25}$

12. Simplify the expression $\ln |\cos \mu| + \ln(1 + \tan^2 \mu)$

13. Verify the following identities:

(a) $\cos^2 \alpha - \sin^2 \alpha = 1 - 2 \sin^2 \alpha$

(b) $\frac{1}{\tan \gamma} + \frac{1}{\cot \gamma} = \tan \gamma + \cot \gamma$

(c) $\cos^2 \theta + \cos^2(\frac{\pi}{2} - \theta) = 1$

(d) $\tan(\sin^{-1} x) = \frac{x}{\sqrt{1-x^2}}$