

- (20 pts) Find the values of all six trigonometric functions, given  $\tan(u) = \frac{3}{8}$  and  $\sin(u) < 0$ .
- (20 pts) Find  $\sin\left(\frac{u}{2}\right)$ ,  $\cos\left(\frac{u}{2}\right)$ , and  $\tan\left(\frac{u}{2}\right)$ , given that  $\cos(u) = \frac{3}{4}$  and  $\frac{3\pi}{2} \leq u < 2\pi$ .
- Consider the equation  $4\sin^2(x) - 3 = 0$ .
  - (20 pts) Find all solutions  $x$ , in radians *and* degrees, to the equation in the interval  $[0, 2\pi)$ .
  - (10 pts) Find all real solutions  $x$ , in radians *and* degrees.
- (10 pts) Re-write  $\sin\left(\tan^{-1}\left(\frac{x}{11}\right)\right)$  as an algebraic expression.
- (5 pts) Square both sides of  $\sin(x) - 1 = \cos(x)$  and solve. Find all solutions in  $[0, 2\pi)$ . Give answer in degrees and radians.
- Find the *exact* value of  $\cos\left(\frac{11\pi}{12}\right)$  in two ways: (Hint: If degrees are easier for you, *use degrees*.)
  - (10 pts) Use a Sum identity.
  - (10 pts) Use a Half-Angle identity
- (5 pts) Re-write  $\sin(\arctan(x) + \arccos(x))$  as an algebraic expression. (Hint: Use Sum identity.)
- (10 pts) Find  $\sin(2u)$ ,  $\cos(2u)$  and  $\tan(2u)$ , given that  $\sin(u) = -\frac{3}{7}$  and  $\cos(u) < 0$ .
- (5 pts) Find the arc length on a circle of radius  $r = 8$  that is intercepted by an angle of  $2100^\circ$ .

(10 pts) Bonus: Answer *one* of the following, for 10 points:

- What angle, in the interval  $[0, 2\pi)$  is coterminal with  $\frac{91\pi}{12}$ ?
- Build a cosine function that achieves its maximum height of  $y = 27$  meters at time  $x = 10$  seconds and its minimum height of  $y = -8$  meters at  $x = 77$  seconds.
- What is the area of the sector intercepted by an arc of  $71^\circ$  in a circle of radius 20? Round to 4 decimal places.
- Find all solutions of the equation  $4\sin^2(3x) - 3 = 0$  in the interval  $[0, 2\pi)$ .
- Sketch the graph of  $13\sin\left(\frac{\pi}{7}x + \frac{2\pi}{7}\right) + 5$ .

