

Do all work on separate paper, provided. All I want on this page is your name.

1. (5 pts) Kindness Points. I'm so glad you followed all formatting preferences I've been talking about all semester, like margins, writing clearly and dark enough for me to read. Thanks for circling final answers, and not cramming too much stuff into a small space. Thanks for organizing your work so that it's easy to follow, from the top on down. Thanks for leaving a 1-inch margin in the top left of each page. I thank you and your classmates thank you.
2. (10 pts) Find the values of all six trigonometric functions, given  $\tan(u) = \frac{3}{4}$  and  $\cos(u) < 0$ .
3. (10 pts) Find  $\sin\left(\frac{u}{2}\right)$ ,  $\cos\left(\frac{u}{2}\right)$ , and  $\tan\left(\frac{u}{2}\right)$ , given that  $\cos(u) = -\frac{\sqrt{2}}{3}$  and  $\sin(u) > 0$ .  
Assume  $0 < u < 2\pi$ . Give final answers in simplified radical form. Be smart with your time.
4. Consider the equation  $4\cos^3(x) - 4\cos^2(x) - 3\cos(x) + 3 = 0$ .
  - a. (10 pts) Find all solutions  $x$ , in radians, to the equation, above, in the interval  $[0, 2\pi)$ . Give *exact* answers, here. (Hint: Factor by grouping.)
  - b. (10 pts) Find *all* real solutions  $x$ , in radians. If you're still more comfortable in degrees, use degrees, and CONVERT to  $\pi$  radians at the end.
5. (10 pts) Re-write  $\tan\left(\arccos\left(\frac{5}{2x}\right)\right)$  as an algebraic expression.
6. Evaluate  $\sin\left(\frac{7\pi}{12}\right)$  in two ways: (Give *exact* answers, in simplified radical form.)
  - a. (10 pts) Use a Sum identity.
  - b. (10 pts) Use a Half-Angle identity.
7. (10 pts) Re-write  $\cos[\operatorname{arcsec}(x) + \arctan(x)]$  as an algebraic expression. Combine into one fraction, but don't worry about rationalizing the denominator.
8. (10 pts) Find  $\sin(2u)$  and  $\cos(2u)$ , given that  $\tan(u) = -\frac{\sqrt{5}}{3}$  and  $\cos(u) > 0$ . Give *exact* answers, in simplified radical form. Don't waste too much time simplifying.

**Bonus: Answer up to three (3) for up to 15 extra points:**

1. A wheel of diameter  $d = 14$  inches rolls 500 yards. To the nearest full revolution, how many revolutions of the wheel were there? (BEWARE CONFLICTING UNITS!)
2. Build a cosine function that achieves its maximum height of  $y = 273$  m at time  $x = 5$  seconds and its minimum height of  $y = -3$  at  $x = 73$  seconds.
3. What is the area of the sector intercepted by an arc of  $108^\circ$  in a circle of radius 50 cm? Give an *exact* answer!
4. Sketch the graph of  $90\sin\left(\frac{\pi}{34}x + \frac{13\pi}{17}\right) - 170$ .
5. Find all solutions  $x \in [0, 2\pi)$  to the trigonometric equation  $6\sin^2\left(\frac{x}{2}\right) + \sin\left(\frac{x}{2}\right) - 2 = 0$ . Give answers in degrees, rounded to 3 decimal places.
6. Give *exact* answers to the previous bonus question.