Do all your work on separate paper.
Clearly label each problem and submit them in proper order.
Leave a 1-inch margin at the top of every page.
If you don't finish a problem, start a fresh sheet of paper for the next one.
Do not erase any work. Put a line through any mistakes, but leave them in place.
There are up to 10 bonus points available. I will grade the first 10 points attempted.
Bonus questions are an assist in preparing for Part 2. (Fair warning!)

1. (5 pts) Convert 160^0 from degrees to radians. Round your answer to three decimal places.

2. (5 pts) Convert $\dfrac{7\pi}{13}$ from radians to degrees. Round your answer to three decimal places.

3. Find the exact value (no calculator!) of each of the following:

    a. (5 pts) $\cos\left(\dfrac{4\pi}{3}\right)$

    b. (5 pts) $\sin\left(\dfrac{4\pi}{3}\right)$

4. (10 pts) Suppose $\sin x = -\dfrac{2}{3}$ and $\cot x = \dfrac{\sqrt{5}}{2}$. Find the value of the other 4 trig functions corresponding to the angle x.

5. (10 pts) Construct a cosine function $g(t) = a\cos(b(t - c)) + d$, where t is time, measured in seconds. Your cosine function $g(t)$ is to have...

    a. ...a period of 3 seconds,

    b. ... a high value of 75 inches at $t = 2$ seconds,

    c. ... and a low value of 15 inches.

6. (5 pts) If the shadow of a 50-foot tree is 38 feet long, what is the angle of the sun?

7. Find the exact value. Use a diagram to show your work.

    a. (5 pts) $\arccos\left(-\dfrac{\sqrt{3}}{2}\right)$

    b. (5 pts) $\arctan(-1)$

Bonus (5 pts) To what point on the unit circle does the angle $\dfrac{4\pi}{3}$ correspond?

Bonus (5 pts) Find all solutions x such that $0 \le x \le 2\pi$ to the equation

$2\sin^2(x) - \sin x - 1 = 0$

Bonus (5 pts) Show that $\sin(2x)\cos(3x) = 8\cos^4(x)\sin(x) - 8\cos^2(x)\sin(x)$.

Bonus (5 pts) Let $x = 6\sin\theta$ and simplify the expression $\sqrt{36 - x^2}$ as far as possible.

Bonus (5 pts) This one relies on having the one before it done correctly. **Double jeopardy *does* attach!**

    a. If you assume that $-\dfrac{\pi}{2} \le \theta \le \dfrac{\pi}{2}$, you can take your answer from the previous bonus problem one more step. Take that step, and explain why you took it.

    b. If you assume that $\dfrac{\pi}{2} \le \theta \le \dfrac{3\pi}{2}$, how will that change your answer to part a, and why?

Bonus (5 pts) Find the length of an arc on a circle with radius 20 centimeters intercepted by a central angle of 47^0. Round your answer to three decimal places.

Bonus (5 pts) At what speed is a bicyclist traveling when her 24-inch-***diameter*** tires are rotating at an angular speed of 3 revolutions per second? Write your answer in feet per second and round your answer to 3 decimal places.

Bonus (5 pts) Find the area of a circular sector with a radius of 8 inches and a central angle of 40^0. Round your answer to two decimal places.