By providing my signature below I acknowledge that I abide by the University's academic honesty policy. This is my work, and I did not get any help from anyone else during the exam:

Name (sign): _____ Name (print): _____

Student Number: _____

Instructor's Name: _____ Class Time: _____

Problem Number	Points Possible	Points Made
1	0	
2	10	
3	10	
4	10	
5	10	
6	15	
7	15	
8	15	
9	15	
Total:	100	

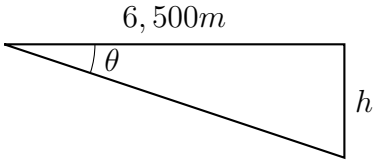
- If you need extra space use the last page.
- Please show your work. **An unjustified answer may receive little or no credit.**
- If you make use of a theorem to justify a conclusion then state the theorem used by name.
- Your work must be **neat**. If I can't read it (or can't find it), I can't grade it.
- The total number of possible points that is assigned for each problem is shown here. The number of points for each subproblem is shown within the exam.
- Please turn off your mobile phone.
- A calculator is not necessary, but numerical answers should be given in a form that can be directly entered into a calculator.
- Common identities:

$$\begin{aligned}\cos(\alpha+\beta) &= \cos(\alpha)\cos(\beta)-\sin(\alpha)\sin(\beta),\\ \sin(\alpha+\beta) &= \sin(\alpha)\cos(\beta)+\cos(\alpha)\sin(\beta).\end{aligned}$$

1. [2 Bonus] Common Knowledge: Will Blanca Vas be in good form to do well in the cyclocross World Cup?

2. Determine the values of the requested quantities in each question below. All values should be either exact or within 0.01 of the true value. (**All angles are given in radians and should be expressed in radians if you have to determine their value**.)

   (a) [5 pts] A pilot looks downward with an angle of depression of 6.2°, and the horizontal distance between the pilot and a ground beacon is estimated to be 6,500m. What is the height of the plane?



   (b) [5 pts] A right triangle has an angle, $\psi = \frac{2\pi}{9}$, and the length of the adjacent side is 3.5m. What are the lengths of the other sides of the triangle?

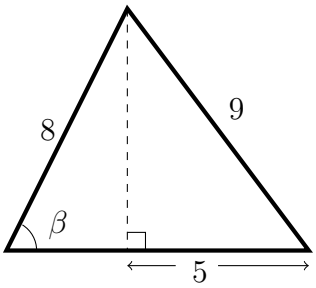
3. Determine the values of the requested quantities in each question below. All values should be either exact or within 0.01 of the true value. (**All angles are given in radians and should be expressed in radians if you have to determine their value**.)

   (a) [5 pts] Determine two other, different positive angles that are coterminal with the angle $\phi = \frac{7\pi}{10}$.

   (b) [5 pts] Determine the exact value of

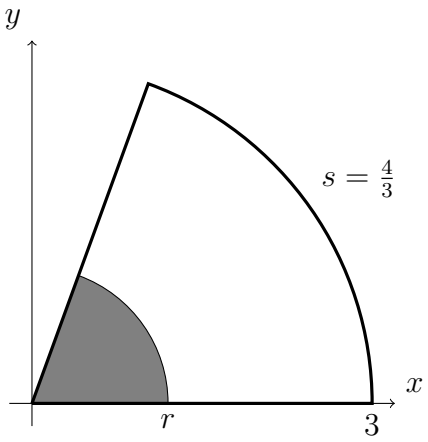
$$\tan\left(\arcsin\left(\frac{3}{14}\right)\right).$$

4. [10 pts] Determine the angle measure of β in radians. If you provide a numerical estimate using a calculator provide an estimate to within two decimal digits.



5. [10 pts] An angle, θ, has a reference angle of $\frac{\pi}{6}$ radians, and the angle θ is between π and $\frac{3\pi}{2}$. Determine the exact angle measure of θ in radians.

6. [15 pts] The area of the small, grey sector is 0.12, and the arclength of the larger sector, s, is $\frac{4}{3}$. The radius of the larger sector is three. Determine the radius of the smaller sector.



7. A point is located on the edge of a circle of radius five meters. The x-value of the coordinate is 3.1, and the angle in standard position to the ray from the point to the origin is between $\frac{3\pi}{2}$ and 2π.

   (a) [5 pts] Determine the y-value of the coordinate.

   (b) [5 pts] Determine the value of the cosine of the angle.

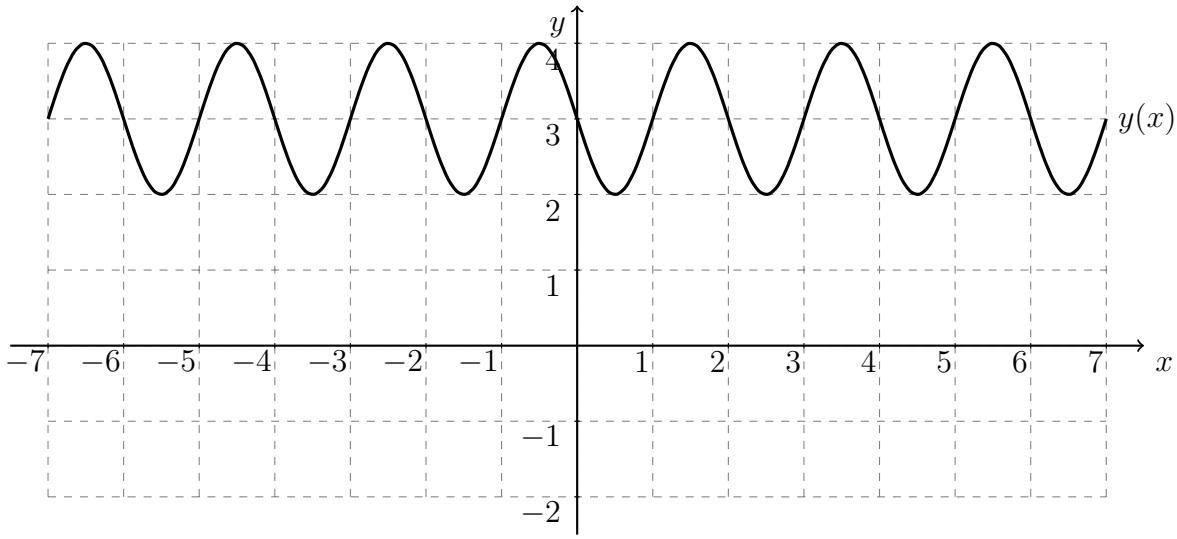
   (c) [5 pts] Determine the value of the angle. If you make a numerical approximation the value should be within two decimal digits of the true value.

8. [15 pts] A spotlight will be hung so it has a vertical height of fifty-five feet above the floor of a stage, and it will shine directly at the face of an actor. The director wants the angle of depression of the light to be 80° in order to achieve the desired impact. Determine the location of the light with respect to an actor who is 5' 3", and the actor will be standing at the center of the stage looking directly at the audience. Your answer should provide enough information for the deck electrician to know where to place the light. (If you provide a numerical approximation, your approximation should be to within two decimal places.)

9. [15 pts] Express the function whose graph is shown below as a sine function,

$$y(x) \;=\; A\cos(Bx + C) + D,$$

where $A > 0$ and $B > 0$.



Extra space for work. **Do not detach this page.** If you want us to consider the work on this page you should print your name, instructor and class meeting time below.

Name (print): _____ Instructor (print): _____ Time: _____