

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              | 15              |             |
| 3              | 15              |             |
| 4              | 15              |             |
| 5              | 20              |             |
| 6              | 10              |             |
| 7              | 10              |             |
| 8              | 15              |             |
| Total:         | 100             |             |

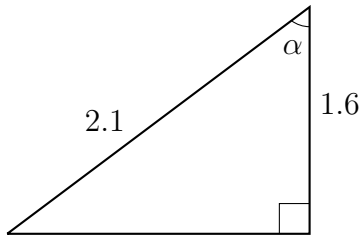
- If you need extra space use the last page.
- Please show your work. **An unjustified answer may receive little or no credit.**
- If you make use of a theorem to justify a conclusion then state the theorem used by name.
- Your work must be **neat**. If I can't read it (or can't find it), I can't grade 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:

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

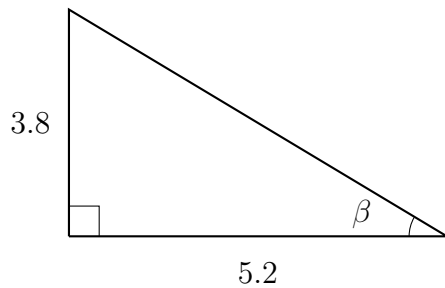
1. [2 Bonus] Common Knowledge: How did one treat Otis Redding when he got weary?

2. Determine the numerical values of the requested quantities in each question below. All values should be to 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 the value of the angle  $\alpha$  in the diagram below.



\_\_\_\_\_ (b) [5 pts] Determine the value of the sine of the angle  $\beta$  in the diagram below.



\_\_\_\_\_ (c) [5 pts] The area of a sector is  $5.7 \text{ m}^2$ , and the angle subtending the sector is 1.8. Determine the radius of the sector.

3. An angle,  $\beta$ , is in the second quadrant, and the value of  $\cos(\beta)$  is -0.4. Another angle,  $\alpha$ , is in the third quadrant, and the value of  $\sin(\alpha)$  is -0.3. Determine the numerical values of each of the quantities below to within 0.01.

\_\_\_\_\_ (a) [5 pts] Determine the value of  $\sin(\beta)$ .

\_\_\_\_\_ (b) [5 pts] Determine the value of  $\tan(\beta + \pi)$ .

\_\_\_\_\_ (c) [5 pts] Determine the value of  $\sin(\alpha + \pi)$ .

4. Determine the **exact values** of each of the following quantities.

(a) [5 pts] Determine the exact value of  $\cos(\arcsin(0.25))$ .

\_\_\_\_\_

(b) [5 pts] Determine the exact value of  $\cos(\arctan(2.1))$ .

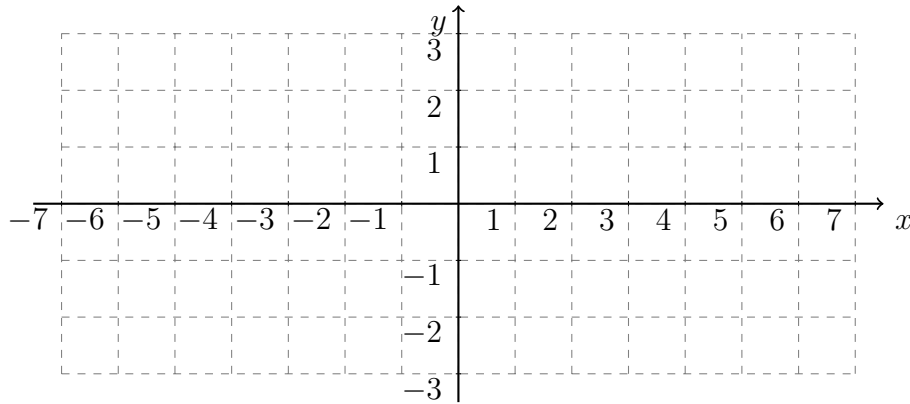
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(c) [5 pts] Determine the exact value of  $\arccos(\cos(\frac{11\pi}{6}))$ . Provide a brief explanation for your answer.

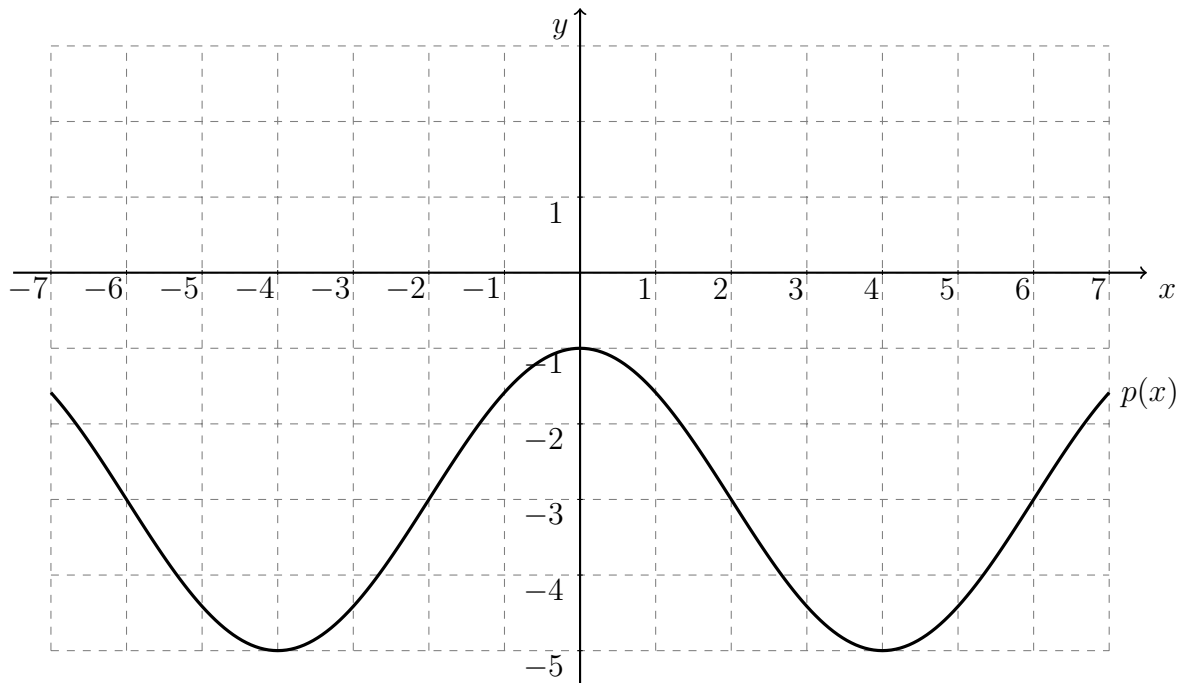
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5. (a) [10 pts] Use the axes below to make a sketch of the graph of the function

$$l(x) = -\sin\left(\frac{\pi}{2}x + \pi\right) + 2$$



- (b) [10 pts] Express the function whose graph is shown below as a sine function.



6. [10 pts] The wheels on Vaea Verbeeck's bicycle have a diameter of 0.65m, and the wheels of Jolanda Neff's bicycle have a diameter of 0.70m. The two ride together on a course that has a length of 15,000m. Assuming they do not race, do not skid, and keep the wheels on the ground (a big assumption), which front wheel turns through a greater angle, and what is the difference in the angles the wheels turn?

7. [10 pts] What is the reference angle (in radians) for the angle 3.8 radians.

\_\_\_\_\_

8. [15 pts] Robert Stroud is standing on top of a building, and he sees a pigeon on the ground away from the building. Robert's angle of depression is  $8.5^\circ$  as he stares at the bird. The bird hops 15m directly away from the building, and the new angle of depression is  $7.0^\circ$ . What is the height of the building?



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: \_\_\_\_\_