

Question 1: After a long day of doing math in the summer you decide to sit down outside and enjoy a cold drink. Your beverage had an initial temperature of 4°C when removed from the refrigerator, and within 15 minutes you observe that the temperature of the drink has reached 10°C . The outside temperature is 30°C .

Recall that Newton's Law of Cooling (and Heating) states that the temperature $u(t)$ of an object at time t is

$$u(t) = T + (u_0 - T)e^{kt}$$

where T is the ambient (surrounding) temperature, u_0 is the initial temperature of the object, and k is a constant.

(a)[7 points] Use the information above to determine the temperature of the beverage 27 minutes after it has been removed from the refrigerator. (Round your final answer to the nearest degree.)

(b)[3 points] How long will it take for the beverage to reach a temperature of 25°C ? (Round to nearest minute.)

Question 2:

(a)[2 points] Convert $-17\pi/6$ to degrees.

(b)[4 points] A bicycle wheel has a radius of 0.35 m and rotates at 5 revolutions per second. What is the speed of the bicycle? (Round to one decimal and state units.)

(c)[4 points] Find the exact value of $\cos\left(\frac{5\pi}{3}\right) + \sin\left(\frac{2\pi}{3}\right)$.

Question 3:

(a)[4 points] If $\csc \theta = 5$ and $\cos \theta < 0$, determine the value of $\tan \theta$.

(b)[3 points] Determine the two angles θ such that $0 \leq \theta < 2\pi$ and $\cos \theta = \sqrt{3}/2$.

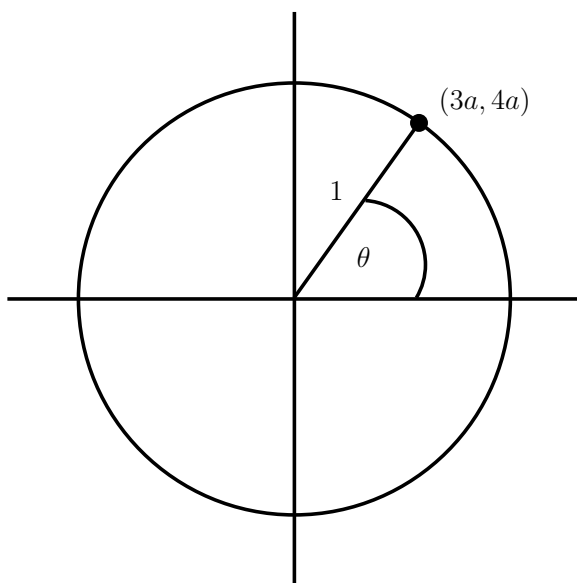
(c)[3 points] If $\sin\left(\frac{7\pi}{12}\right) = a$, determine $\sin\left(-\frac{31\pi}{12}\right)$.

Question 4:

(a)[3 points] Determine $\sin\left(\frac{1003\pi}{2}\right)$

(b)[3 points] If θ is in the first quadrant and $\cos\left(\theta - \frac{\pi}{2}\right) = \frac{1}{2}$, determine $\sin \theta$.

(c)[4 points] Use the information in the unit circle below to determine $\cos \theta$:



Question 5:

(a)[7 points] Carefully sketch the graph of $y = -3 \cos\left(4x + \frac{\pi}{2}\right) + 1$.

(b)[3 points] State the period, amplitude and phase-shift of the function in (a).