1. Convert the measures below, showing all work.   [6]

a) $\dfrac{11\pi}{9}$ to degrees, round answer to one decimal place, if necessary.

b)   3.748 radians   to degrees, round answer to one decimal place, if necessary

c) $167°$ to radians, round the answer to two decimal places.

2. The radius of a circle is 30 cm. Determine the arc length if the central angle is 2.1π .
                                                                                    [2]

3. If a ball travels around a circle of radius 6 m in 2.5 minutes, what is the angular speed of the ball in radians/s?   [2]

4. For each of the following trigonometric ratios, sketch the angle in standard position; identify the related acute angle and find the exact value of the trig ratio. Show all work. [9]

a) $\cos \dfrac{11\pi}{6}$

b) $\csc \dfrac{13\pi}{4}$

c) $\cot \dfrac{2\pi}{3}$

5. . Sketch the graph of $y = \sec x$ for one period.   [3]

6. The value of $\sin \theta = -\dfrac{25}{26}$, where $0 \le \theta \le 2\pi$.

(a) In which quadrant(s) could the terminal arm of θ lie? _____
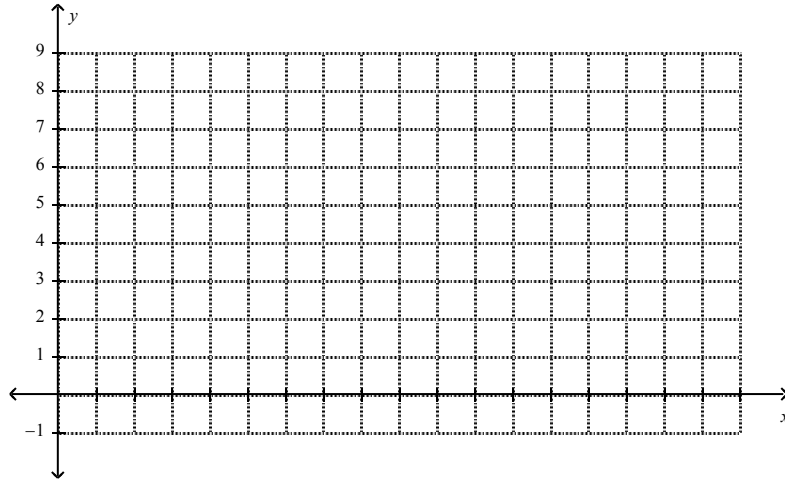
[1]

(b) Determine **all** possible trigonometric ratios (primary and reciprocal) for θ in Quadrant IV. Leave your answers in radical form.

[6]

(c) Determine θ in radians to two decimal places. [2]

7. Sketch the graph of $y = -2\cos\left(\dfrac{1}{4}x - \dfrac{\pi}{8}\right) + 3$ by determining the amplitude, the equation of the axis of the curve, the period and the phase shift relative to $y = \cos x$.   [6]

8. Use the difference quotient to find the approximate instantaneous rate of change for the function $y = 3\tan\left(\dfrac{\pi}{4}x\right) + 2$ when $a = 3$ and $h = 0.001$.

9. The depth of water, in metres, in a harbour as a function of time, in hours, can be described by a cosine function. The maximum depth is 12 m, the minimum is 1.5 m.
At 12:00 midnight, ($t = 0$), the depth is at its minimum. In 65 hours, the minimum depth is reached 6 times (including the times at $t = 0$ and $t = 65$). [8]

(a) What is the equation of the cosine function that describes the depth of water in the harbour?

(b) **At what time** after midnight did the depth of the water **first** reach 6.75m?
Round off your answer to the nearest minute.

10. It was found that the approval rating of a politician during the time that she was in office could be modelled by the sinusoidal function A(t) = $0.25\sin(\dfrac{\pi}{730}t) + 0.55$, where A(t) is the approval rating and t is the number days that the politician was in office. If the politician was in office for 8 years, give the intervals during which her approval rating was going down.   [8]