Question 1:

(a)[**7 points**] Carefully sketch the graph of $y = -\sin(2x + \frac{\pi}{2}) + \frac{1}{2}$ for x in the interval $[-\pi, \pi]$. (You may show more of the graph if you wish). Clearly show the x and y axes, and indicate the scale on the axes.

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

Question 2: **[10 points]** Compute exactly (without a calculator). Show work to support your answer.

(a)[2 points]

$$\sec\left(\frac{\pi}{6}\right)$$

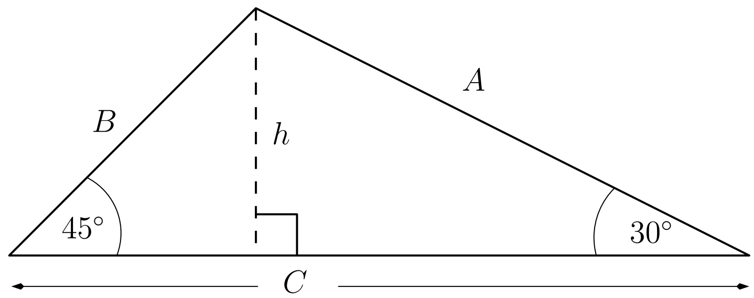
(b)[4 points]

$$\frac{\cot(\alpha)}{\cos(\alpha)} - \frac{1}{\sin(\alpha)}$$

(c)[4 points]

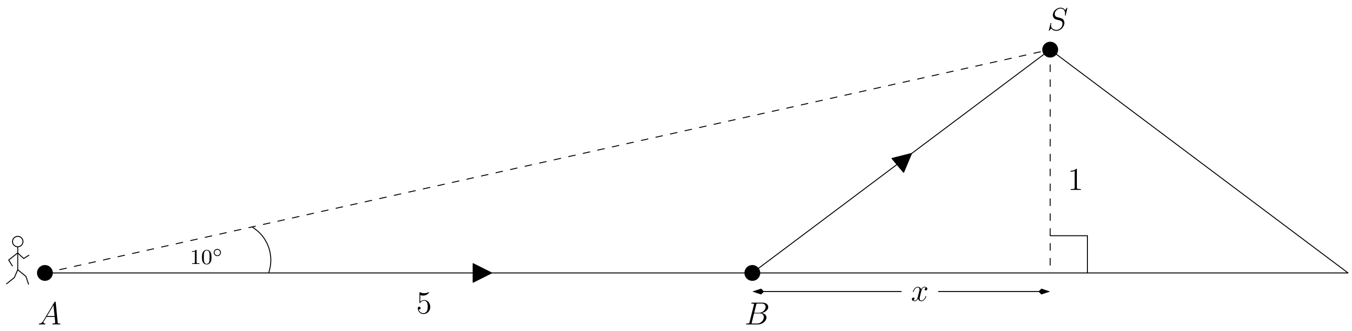
$$\cot\left(\frac{17\pi}{4}\right)\sec\left(\frac{\pi}{4}\right)$$

Question 3:



In the triangle above, determine the lengths of sides A, B and C in terms of the measurement h.

Question 4:



A person at point A wishes to hike to the summit S of the mountain along the path as shown. The mountain has an elevation of 1 km, and the hiker is 5 km from the base B of mountain. The hiker measures the angle of elevation to the top of the mountain to be 10°. Find the total length of the hike from point A to the summit S. (Give your answer in kilometres, rounded to one decimal place.) You may find it useful to determine x first.

Question 5:

(a)[**5 points**] Use identities to simplify

$$\sqrt{2}\cos\left(\alpha + \frac{\pi}{4}\right) + \sin\alpha\ .$$

(b)[**5 points**] Use identities to find an exact value for $\sin(15^\circ)$.

You may find some of the following formulas useful:

$$\frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}$$

$$c^2 = a^2 + b^2 - 2ab\cos(C)$$

$$\sin(A+B) = \sin(A)\cos(B) + \cos(A)\sin(B)$$

$$\sin(A-B) = \sin(A)\cos(B) - \cos(A)\sin(B)$$

$$\cos(A+B) = \cos(A)\cos(B) - \sin(A)\sin(B)$$

$$\cos(A-B) = \cos(A)\cos(B) + \sin(A)\sin(B)$$

$$\sin^2(A) + \cos^2(A) = 1$$

$$\sin(2A) = 2\sin(A)\cos(A)$$

$$\cos(2A) = \cos^2(A) - \sin^2(A)$$

$$\sin^2(A) = \frac{1-\cos(2A)}{2}$$

$$\cos^2(A) = \frac{1+\cos(2A)}{2}$$