1.   If the vertex of a parabola $y = 2x^2 + kx + 9$ is on the x-axis, find the value(s) of k.

2.   If $f(x) = \sqrt{\tan x^2}$, evaluate $f'\left(\frac{\sqrt{\pi}}{2}\right)$.

3.   Give the exact answer of

$$\int_{-\pi/6}^{\pi/6} \sin x \ dx$$

4.   It is known that 1% of the population has a certain disease. A test for this disease is 98% accurate. This means that the outcome of the test is correct 98% of the time. Given that a person tests positive, what is the probability of the person actually has the disease? (answer in exact form)

5.   Given $2^x + 2^{x+1} = 9$, solve for x.

6.   Let $A = \begin{bmatrix} 1 & -3 & 7 \\ 2 & -1 & 5 \\ -2 & 6 & 3 \end{bmatrix}$ and $\vec{b} = \begin{bmatrix} 4 \\ 9 \\ 9 \end{bmatrix}$. If $A\vec{x} = \vec{b}$, Determine $|\vec{x}|$.

7.   Find the acute angle in degrees between two intersecting lines that have the direction vectors of $3\vec{i} - 2\vec{j} + 5\vec{k}$ and $-\vec{i} + 3\vec{j} - 5\vec{k}$ respectively. (answer correct to 3 sig. fig.)

8.   Find the area of the triangle to the nearest cm^2.
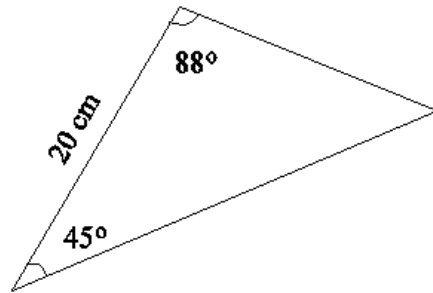
9.   The mean age of the students in a grade 12 class is 17.4 years old and the standard deviation is 0.6 years. After 10 years, they all meet again at the school reunion. What are the new mean and the standard deviation of their ages?

10. A barn contains a large number of apples of which one-fifth are green apples and the rest are red apples. The apples are picked at random from the barn. How many apples must be picked so that the probability that there is at least one green apple among them is greater than 95%?