Calderglen High School
Mathematics Department

Higher Mathematics

Unit 3 : Practice Assessment

Read carefully

1. **Calculators may be used in this paper.**
2. **Full credit will be given only where the solution contains appropriate working.**
3. **Answers obtained by readings from scale drawings will not receive any credit.**

Outcome 1 : Vectors in three dimensions

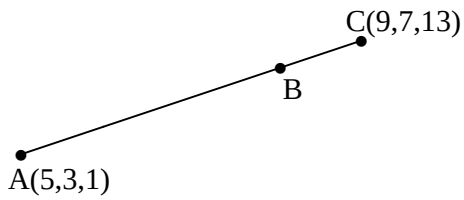
1. The points W, X and Y have coordinates (-2, 3, 1), (-1, 5, 2) and (3, 13, 6) respectively.

   (a) Write down the components of $\overrightarrow{WY}$. **1**

   (b) Hence show that the points W, X and Y are collinear. **3**

2. The point B divides AC in the ratio 3:1, as shown in the diagram.

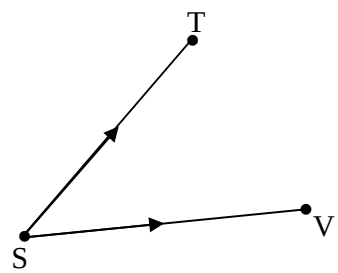
   Find the coordinates of B.



3

3. The diagram, opposite, shows vectors $\overrightarrow{ST}$ and $\overrightarrow{SV}$ where

$$\overrightarrow{ST} = \begin{pmatrix} -2 \\ 3 \\ 0 \end{pmatrix} \quad \text{and} \quad \overrightarrow{SV} = \begin{pmatrix} 1 \\ 1 \\ 3 \end{pmatrix}$$



   (a) Find $\overrightarrow{ST}.\overrightarrow{SV}$ **1**

   (b) Hence find the size of angle TSV. **4**

Outcome 2 : Further differentiation and integration

4. (a) Given $y = \frac{3}{4}\sin x$, find $\frac{dy}{dx}$ **1**

   (b) Differentiate $7\cos x$ with respect to x. **1**

5. Given $f(x) = (4x-9)^{-5}$ find $f'(x)$ **2**

6. (a) Find $\int 9\sin x \; dx$ **2**

   (b) Integrate $-\frac{1}{5}\cos x$ with respect to x. **1**

7. Evaluate $\int_2^3 (x-1)^4 \; dx$ **4**

Outcome 3 : Properties of logarithmic and exponential functions

8. (a) Simplify $\log_a 40 - \log_a 5$ **1**

(b) Simplify $\log_{12} 3 + 2\log_{12} 2$ **4**

9. Solve $e^x = 1.9$ **2**

10. Solve $\log_3(x-5) = 2$ **2**

Outcome 4 : Further trigonometric relationships

11. Express $5\cos x° + 3\sin x°$ in the form $k\cos(x-\alpha)°$ where $k > 0$ and $0 \le \alpha \le 360$ **5**

End of Question Paper