



SPTA

Higher Homework

Mixed 8



Vectors, Angle Formulae & Differentiation

1. The diagram shows two right-angled triangles with angles c and d marked as shown.



(4)

(a) Find the exact value of $\sin(c + d)$.

(b) (i) Find the exact value of $\sin 2c$.

(ii) Show that $\cos 2d$ has the same exact value.

(4)

2. D, E and F have coordinates $(10, -8, -15)$, $(1, -2, -3)$ and $(-2, 0, 1)$ respectively.

(a) (i) Show that D, E and F are collinear.

(ii) Find the ratio in which E divides DF .

(4)

(b) G has coordinates $(k, 1, 0)$.

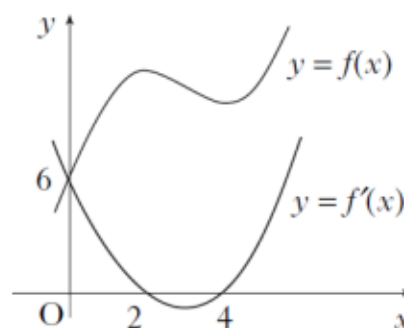
Given that DE is perpendicular to GE , find the value of k .

(4)

3. The diagram shows the graphs of a cubic function $y = f(x)$ and its derived function $y = f'(x)$.

Both graphs pass through the point $(0, 6)$.

The graph of $y = f'(x)$ also passes through the points $(2, 0)$ and $(4, 0)$.



(a) Given that $f'(x)$ is of the form $k(x - a)(x - b)$:

(i) write down the values of a and b ;

(ii) find the value of k .

(3)

(b) Find the equation of the graph of the cubic function $y = f(x)$.

(4)

4. A function f is defined on the domain $0 \leq x \leq 3$ by $f(x) = x^3 - 2x^2 - 4x + 6$.

Determine the maximum and minimum values of f .

(7)