SPTA
Higher Homework
Mixed 9 Vectors, Functions, Quadratics, Int, Polynomials & Logs

1. (a) Functions f and g are defined on the set of real numbers by

- $f(x) = x^2 + 3$
- $g(x) = x + 4$.

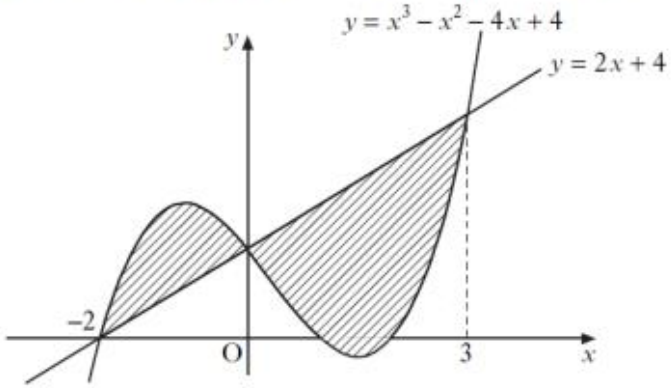
(a) Find expressions for:

(i) $f(g(x))$;
(ii) $g(f(x))$. **(3)**

(b) Show that $f(g(x)) + g(f(x)) = 0$ has no real roots. **(3)**

2. The diagram shows the curve with equation $y = x^3 - x^2 - 4x + 4$ and the line with equation $y = 2x + 4$.

The curve and the line intersect at the points $(-2, 0)$, $(0, 4)$ and $(3, 10)$.



Calculate the total shaded area. **(10)**

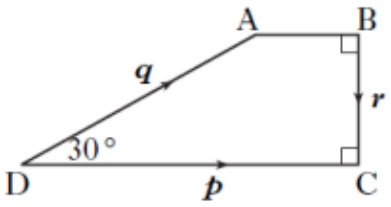
3. (a) (i) Show that $x = 1$ is a root of $x^3 + 8x^2 + 11x - 20 = 0$.
(ii) Hence factorise $x^3 + 8x^2 + 11x - 20$ fully. **(4)**

(b) Solve $log_2(x + 3) + log_2(x^2 + 5x - 4) = 3$. **(5)**

4. Vectors p, q and r are represented on the diagram shown where angle $ADC = 30°$.

It is also given that $|p| = 4$ and $|q| = 3$.

Evaluate $p.(q + r)$ and $r.(p - q)$.



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