**Partial Fractions and Binomial Expansions – 2020 A2**

**1.** Nov/2020/Paper_9709/31/No.9

Let $f(x) = \dfrac{8 + 5x + 12x^2}{(1 - x)(2 + 3x)^2}$.

**(a)** Express $f(x)$ in partial fractions. [5]

**(b)** Hence obtain the expansion of $f(x)$ in ascending powers of $x$, up to and including the term in $x^2$. [5]

**2.** Nov/2020/Paper_9709/32/No.2

**(a)** Expand $\sqrt[3]{1+6x}$ in ascending powers of $x$, up to and including the term in $x^3$, simplifying the coefficients. [4]

**(b)** State the set of values of $x$ for which the expansion is valid. [1]

**3.** Nov/2020/Paper_9709/32/No.9a

Let $f(x) = \dfrac{7x + 18}{(3x + 2)(x^2 + 4)}$.

**(a)** Express $f(x)$ in partial fractions. [5]

**4.** June/2020/Paper_9709/31/No.2

**(a)** Expand $(2 - 3x)^{-2}$ in ascending powers of $x$, up to and including the term in $x^2$, simplifying the coefficients. [4]

**(b)** State the set of values of $x$ for which the expansion is valid. [1]

**5.** June/2020/Paper_9709/33/No.7

Let $\mathrm{f}(x) = \dfrac{2}{(2x-1)(2x+1)}$.

**(a)** Express $\mathrm{f}(x)$ in partial fractions. [2]

**(b)** Using your answer to part **(a)**, show that

$$(\mathrm{f}(x))^2 = \frac{1}{(2x-1)^2} - \frac{1}{2x-1} + \frac{1}{2x+1} + \frac{1}{(2x+1)^2}.$$ [2]

**(c)** Hence show that $\displaystyle\int_1^2 (\mathrm{f}(x))^2 \,\mathrm{d}x = \frac{2}{5} + \frac{1}{2}\ln\left(\frac{5}{9}\right)$. [5]

**6.** March/2020/Paper_9709/32/No.9

Let $f(x) = \dfrac{2 + 11x - 10x^2}{(1 + 2x)(1 - 2x)(2 + x)}$.

**(a)** Express $f(x)$ in partial fractions. [5]

**(b)** Hence obtain the expansion of $f(x)$ in ascending powers of $x$, up to and including the term in $x^2$. [5]