Exercise 28

(1) $e^2 . e^3 = e^5$

(2) $e^2 + e^3$ (we cannot simplify)

(3) $\ln(2) \cdot \ln(3)$ (we cannot simplify)

(4) $\ln(2) + \ln(3) = \ln(2\times 3) = \ln(6)$

(5) $e^{(e^2)}$ (we cannot simplify)

(6) $(e^e)^2 = e^{2e}$.

(7) $2^{(3^2)} = 2^9 = 512$

(8) $(2^3)^2 = 8^2 = 64$

(9) $\ln(5^3) = 3\ln(5)$

(10) $\ln(5\times 3) + \ln(\frac{5}{3}) = \ln(5) + \cancel{\ln(3)} + \ln(5) - \cancel{\ln(3)}$
$= 2\ln(5)$

(11) $\ln(5+3) = \ln(8)$

(12) $\ln(\ln(5^3)) = \ln(3\ln(5))$
$= \ln(3) + \ln(\ln(5))$.

Ex 29

- Given $x \in \mathbb{R}$, $f(x)$ is well defined as soon as $3 - 5x > 0$ that is $\boxed{x < \frac{3}{5}}$ $\boxed{\mathcal{D}_f =]-\infty, \frac{3}{5}[}$

- Given $x \in \mathbb{R}$, $g(x)$ is well defined as soon as $3x^2 + 2x - 1 > 0$
the discriminant of the polynomial $3X^2 + 2X - 1$ is $\Delta = 4 + 4\times 3 = 16$
and the roots are $\frac{-2 \pm 4}{6} = -1$ and $\frac{1}{3}$.

Hence $\boxed{\mathcal{D}_g =]-\infty, -1[\cup]\frac{1}{3}; +\infty[}$

• h is well defined if $\frac{x-1}{2x+4}$ is well defined and strictly positive

We make a table of the signs

x	$-\infty$		-2		1		$+\infty$
$x-1$		$-$		$-$	0	$+$	
$2x+4$		$-$	0	$+$		$+$	
$\frac{x-1}{2x+4}$		$+$	$\times$	$-$	0	$+$	

Hence $\boxed{\mathcal{D}_h =]-\infty, -2[\cup]1, +\infty[}$

• $f(x)$ is well defined if $\ln(x)$ is well defined and strictly positive, This is the case for $x > 1$.

$\boxed{\mathcal{D}_f =]1, +\infty[}$