a) i) $T_1 = 1000$ $d = 750$

$$T_9 = a + (n-1)d$$
$$= 1000 + (9-1)750$$
$$= 7000$$
$$= 7\,km$$

$\therefore$ In the 9th week she ran 7 km

ii) $10000 = a + (n-1)d$
$$= 1000 + (n-1)750$$
$$= 1000 + 750_n - 750$$

$10000 = 250 + 750n$
$-250 \qquad -250$

$9750 = 750n$
$$n = \frac{9750}{750}$$

$$n = 13$$

$\therefore$ In her 13th Week she ran 10km

iii) $Sum = \frac{n}{2}[2a + (n-1)d]$

$= \frac{26}{2}[2(1000) + (25)750]$

$= 13[2000 + 18750]$

$= 13[20750]$

$= 269750 \ m$

$\therefore \ 269.75 \ Km$

$\therefore$ In $26\frac{1}{2}$ weeks she ran $269.75 \ km$

b) $y = e^{2x}$
$y = e^{-x}$

$\int_0^2 e^{2x} - e^{-x} \ dx$

$= \left[2e^{2x} + e^{-x}\right]_0^2$

$= \left[\left(2e^{2(2)} + e^{-2}\right) - \left(2e^{2(0)} + e^{-0}\right)\right]$
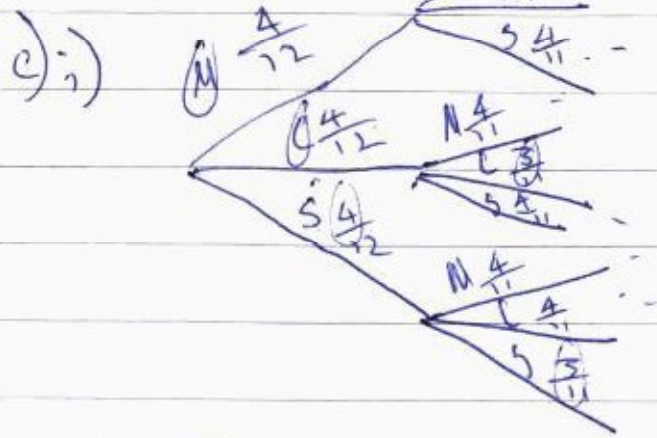
$= \left(2e^4 + e^{-2}\right) - \left(2 \times 1 + 1\right)$

$= 2e^4 + e^{-2} - 3$

You may ask for an extra Writing Booklet if you need more space to answer question 4.

Start here.

c) i)

M $\frac{4}{12}$

$M\frac{3}{11}$

$C\frac{4}{11}$

$S\frac{4}{11}$

C $\frac{4}{12}$ $M\frac{4}{11}$

$C\frac{3}{11}$

$S\frac{4}{11}$

S $\frac{4}{12}$ $M\frac{4}{11}$

$C\frac{4}{11}$

$S\frac{3}{11}$

M = Mint
S = Strawberry
C = Caramel

$$P\left(MM\right) = \frac{4}{12} \times \frac{3}{11}$$

$$= \frac{1}{11}$$

ii) $P\left(MM\right) + \left(CC\right) + \left(SS\right)$

$$= \frac{1}{11} + \frac{1}{11} + \frac{1}{11}$$

$$= \frac{3}{11}$$

iii) $P\left(2 \text{ chocolates have different centres}\right)$

$$= \left(\frac{4}{12} \times \frac{4}{12}\right) + \left(\frac{4}{12} \times \frac{4}{12}\right) + \left(\frac{4}{12} \times \frac{4}{12}\right) + \left(\frac{4}{12} \times \frac{4}{12}\right)$$
$$+ \left(\frac{4}{12} \times \frac{4}{12}\right) + \left(\frac{4}{12} \times \frac{4}{12}\right)$$

$$= \frac{1}{9} \times 6$$

$$= \frac{2}{3}$$

d) $f(x) = 1 + e^x$

$f(-x) = 1 + e^{-x}$

$\therefore \quad \left(1 + e^x\right) * \left(1 + e^{-x}\right) = \left(1 + e^x\right) + \left(1 + e^{-x}\right)$

$1 + e^{-x} + e^x + \left(e^x \times e^{-x}\right) = 2 + e^x + e^{-x}$