Candidate 1 evidence

QUESTION NUMBER

1.

1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

$$\left(x^{-1}-3x\right)^4$$

$$= \binom{0}{4}\left(x^{-1}\right)^4\left(-3x\right)^0 + \binom{1}{4}\left(x^{-1}\right)^3\left(-3x\right)^1 + \binom{2}{4}\left(x^{-1}\right)^2\left(-3x\right)^2 + \binom{3}{4}\left(x^{-1}\right)^1\left(-3x\right)^3$$
$$+ \binom{4}{4}\left(x^{-1}\right)^0\left(-3x\right)^4$$

$$= (1)\left(x^{-4}\right)(1) + (4)\left(x^{-3}\right)\left(-3x\right) + (6)\left(x^{-2}\right)\left(9x^2\right) + (4)\left(x^{-1}\right)\left(-27x^3\right) +$$
$$(1)(1)\left(81x^4\right)$$

$$= x^{-4} - 12x^{-2} + 54 - 108x^2 + 81x^4$$

$$= \frac{1}{x^4} - \frac{12}{x^2} + 54 - 108x^2 + 81x^4$$

Candidate 2 evidence

QUESTION NUMBER

1.

27
3

1 1
1 2 1
1 3 3 1
1 4 6 4 1

$$\left(\frac{1}{x} - 3x\right)^4 = \binom{4}{0}(x^{-1})^4 \cdot (-3x)^0 + \cancel{\binom{4}{1}}$$

$$+ \binom{4}{1}(x^{-1})^3 \cdot (-3x)^1 + \binom{4}{2}(x^{-1})^2 \cdot (-3x)^2$$

$$+ \binom{4}{3}(x^{-1})^1 \cdot (-3x)^3 + \binom{4}{4}(x^{-1})^0 \cdot (-3x)^4$$

$$= x^{-4} + (4 \times x^{-3} \cdot -3x) + (6 \cdot x^{-2} \cdot 9x^2)$$

$$+ (4 \cdot x^{-1} \cdot -27x^3) + (81x^4)$$

$$= x^{-4} - 12x^{-3} + 54 - 108x^2 + 81x^4$$

$$= \boxed{81x^4 - 108x^2 - \frac{12}{x^3} + \frac{1}{x^4}}$$

Candidate 3 evidence

$$(1x^{-1} - 3x)^4$$

$$1\cdot(1x^{-1})^4 + 4\cdot(1x^{-1})^3(-3x)^1 + 6\cdot(1x^{-1})^2(-3x)^2 + 4\cdot(1x^{-1})^1(-3x)^3$$

$$+ 4\cdot(-3x)^4$$

$$= x^{-4} + 4x^{-3}(-3x) - 18x^{-2}(x^2) + 4x^{-1}(-3x)^3 + 4(-3^4x^4)$$

$$= \frac{1}{x^4} - 12x^{-2} - 18 + 4x^{-1}(-27x^3) - 324x^4$$

$$= \frac{1}{x^4} - \frac{12}{x^2} - 18 - 108x^2 - 324x^4$$

Candidate 4 evidence

QUESTION NUMBER	
1.	$\binom{4}{r}\left(\frac{1}{x}\right)^{4-r}(-3x)^{r}$ $=\binom{4}{r}(1)^{4-r}(x)^{r-4}(-3x)^{r}$ $=\binom{4}{r}(1)^{4-r}(x)^{r-4}(-3)^{r}(x)^{r}$ $=\binom{4}{r}(1)^{4-r}(x)^{2r-4}(-3)^{r}$ //

Candidate 5 evidence

QUESTION NUMBER	
7.	$\frac{dy}{dx} = \frac{y}{2x-1}$

$2x-1 \; dy = y \; dx$

$\int \frac{1}{y} \, dy = \int \frac{1}{2x-1} \, dx$

$\ln|y| = \frac{1}{2} \ln|2x-1| + c$

$e^{\ln|y|} = e^{\frac{1}{2}\ln|2x-1|} + e^{c}$

$\cancel{e^{\ln|y|}}\cancel{y} = \cancel{e^{\ln}} |(2x-1)|^{\frac{1}{2}} + e^{c}$

$y = (2x-1)^{\frac{1}{2}} + A$

$y = \sqrt{2x-1} + A$

$12 = \sqrt{10-1} + A$

$12 = \sqrt{9} + A$

$12 = 3 + A$

$A = 9$

$y = \sqrt{2x-1} + 9$

Candidate 6 evidence

7. $\frac{dy}{dx} = \frac{y}{2x-1}$

$y = 12$ when $x = 5$

$\frac{dy}{y} = \frac{dx}{2x-1}$

$\ln y = \frac{1}{2}\ln|2x-1| + C$

$\ln 12 = \ln(9)^{1/2} + C$

$\ln 12 - \ln 3 = C$

$\ln \frac{12}{3} = C$

$\ln 4 = C$

$\therefore \ln y = \frac{1}{2}\ln|2x-1| + \ln 4$

$y = |2x-1|^{1/2} + 4$

$y = \sqrt{2x-1} + 4$

Candidate 7 evidence

QUESTION NUMBER

7.

$$\frac{dy}{dx} = \frac{y}{2x-1}$$

~~$\ln y - 2\ln(2x-1)$~~ $= c$

~~$\ln + 2$~~

$$dy\,(2x-1) = y\,dx$$

$$\int \frac{dy}{y} = \int \frac{dx}{(2x-1)}$$

$$= \ln y\ \cancel{\frac{dy}{dx}} = 2\ln|2x-1| + c.$$

$$e^{\ln y} = e^{2\ln|2x-1|+c}$$

$$e^{\ln y} = e^{\ln(2x-1)^2} \cdot e^{c}. \quad (e^c = A)$$

$$y = A(2x-1)^2$$

$$12 = A\,(2(5)-1)^2$$

$$A = \frac{12}{81}$$

$$y = \frac{12(2x-1)}{81}$$

$$\boxed{y = \frac{4(2x-1)}{27}.}$$

$3\overline{)81}^{\,27}$ $\quad \frac{4}{27}$

Candidate 8 evidence

$e^{\ln(2x-1)^{\frac{1}{2}}} \times e^{\ln 4}$

QUESTION NUMBER

17.

$\frac{dy}{y} = \frac{dx}{2x-1}$

$\frac{1}{y}\,dy = \frac{1}{2x-1}\,dx$

$\int \frac{1}{y}\,dy = \int \frac{1}{2x-1}\,dx$

$\ln(y) = \frac{\ln(2x-1)}{2} + c$

$\ln(12) = \frac{1}{2}\ln(9) + c$

$\cancel{\frac{1}{2}\ln(9) - \ln(12) + c = 0}$

$\cancel{\frac{1}{2}\ln\left(\frac{9}{12}\right) + c = 0}$

$\cancel{\frac{1}{2}\ln\left(\frac{3}{4}\right) + c}$

$c = \frac{1}{2}$

$\ln(12) - \frac{1}{2}\ln(9) = c$

$\ln(12) - \ln(9)^{\frac{1}{2}} = c$

$\ln(12) - \ln(3) = c$

$c = \ln\left(\frac{12}{3}\right)$

$c = \ln 4$

$\cancel{\ln(y) = \frac{\ln(2x-1)}{2} + \ln 4}$

$\cancel{e^{\ln(y)} = e^{\ln(2x-1)^{\frac{1}{2}} + \ln 4}}$

$\cancel{y = e^{\ln(2x-1)^{\frac{1}{2}} + \ln 4}}$

$\cancel{y = e^{\ln(2x-1)^{\frac{1}{2}}} \times e^{\ln 4}}$

$\ln(y) = \ln(2x-1)^{\frac{1}{2}} + \ln 4$

$e^{\ln(y)} = e^{\ln(2x-1)^{\frac{1}{2}}} \times e^{c}$

$y = (2x+1)^{\frac{1}{2}} \times e^{\ln 4}$

$y = (2x+1)^{\frac{1}{2}} \times 4$

$y = 4(2x+1)^{\frac{1}{2}}$

Candidate 9 evidence

8.(c)

$\overrightarrow{TP} = P - T$

$= \begin{pmatrix} 2 \\ 11 \\ 6 \end{pmatrix} - \begin{pmatrix} 2 \\ 4 \\ -1 \end{pmatrix}$

$= \begin{pmatrix} 0 \\ 7 \\ 7 \end{pmatrix} = 7\begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$ $\quad \underline{u} = \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$

$L_2 = \underline{u}t + P$

$= \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix} t + \begin{pmatrix} 2 \\ 11 \\ 6 \end{pmatrix}$

$x = 2$

$y = t + 11$

$z = t + 6$

Candidate 10 evidence

8.(c)

TP. $\cancel{\begin{pmatrix} 2 \\ 4 \\ -1 \end{pmatrix} - \begin{pmatrix} 2 \\ 11 \\ 6 \end{pmatrix} = \begin{pmatrix} 0 \\ -7 \\ -7 \end{pmatrix}}$ normal.

$\begin{pmatrix} 2 \\ 11 \\ 6 \end{pmatrix} - \begin{pmatrix} 2 \\ 4 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 7 \\ 7 \end{pmatrix}$ normal.

Equation of L_2. (Point T)

$x = 2 \quad y = 4 + 7t \quad z = -1 + 7t$

(point P)

$x = 2 \quad y = 11 + 7t \quad z = 6 + 7t$.

Candidate 11 evidence

8.(c)

$\overrightarrow{TP}$

$= p - t$

$= \begin{pmatrix} 2 \\ 11 \\ 6 \end{pmatrix} - \begin{pmatrix} 2 \\ 4 \\ -1 \end{pmatrix}$

$= \begin{pmatrix} 0 \\ 7 \\ 7 \end{pmatrix}$

$L_2 = \frac{x-2}{0} = \frac{y-4}{7} = \frac{z+1}{7} = r$

$x = 0r \quad y = 7r + 4 \quad z = 7r - 1$

Candidate 12 evidence

8.(c)

$P = (2, 11, 6)$

$T = (0, 4, -1)$

$\cancel{\overrightarrow{PT} = (}$

$\overrightarrow{TP} = \begin{pmatrix} 2 \\ 7 \\ 7 \end{pmatrix}$

$\cancel{\frac{x-2}{2} = \frac{y-11}{7} = \frac{z-6}{7}}$

$\cancel{x = 2t + 2}$

$\cancel{y = 7t + 11}$

$\cancel{z = 7t + 6}$

$\frac{x}{2} = \frac{y-4}{7} = \frac{z+1}{7}$

$x = 2t$

$y = 7t + 4$

$z = 7t - 1$