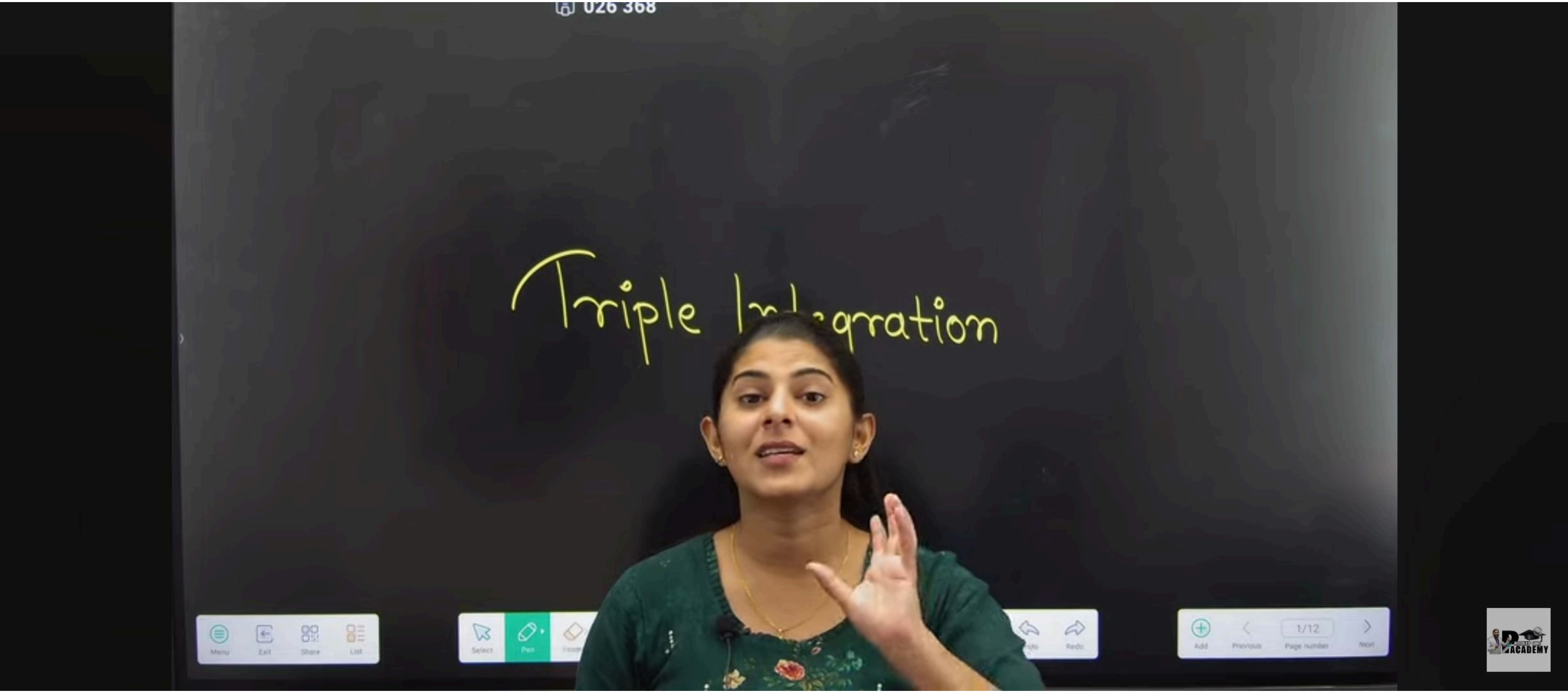
026 368
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026 368

$$\int_{x=a}^{x=b}\int_{y=\phi_1(x)}^{y=\phi_2(x)}\int_{z=f_1(x,y)}^{z=f_2(x,y)} f(x,y,z)\,dz\,dy\,dx$$

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① $$\int_{y=0}^{y=1}\int_{x=y^2}^{x=1}\int_{z=0}^{z=1-x} x\,dz\,dx\,dy$$

288 512

$$\int_0^1 \int_{y^2}^1 [xz]_0^{1-x} \, dx\,dy$$

$$\int_0^1 \int_{y^2}^1 [x - x^2] \, dx\,dy$$

$$\int_{0} \int_{y^2} [\ x \ \ \ \ x\, dx\, dy$$

$(y^2)^3$

$$\int_0^1 \left[\frac{x^2}{2} - \frac{x^3}{3}\right]_{y^2}^{1} dy$$

$$\int_0^1 \left[\frac{1}{2} - \frac{1}{3} - \left(\frac{y^4}{2} - \frac{y^6}{3}\right)\right] dy$$

$$= \int_0^1 \frac{1}{6} - \frac{y^4}{2} + \frac{y^6}{3} \quad dy$$

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$$\int_0^1 \left[\frac{1}{2} - \frac{1}{3}\left(\frac{y^4}{2} - \frac{y^6}{3} \right) \right] dy$$

$$= \int_0^1 \frac{1}{6} - \frac{y^4}{2} + \frac{y^6}{3} \quad dy$$

$$= \left[\frac{y}{6} - \frac{y^5}{10} + \frac{y^7}{21} \right]_0^1$$

$$= \left[\frac{1}{6} - \frac{1}{10} + \frac{1}{21} - 0 \right]$$

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$$= \left[\frac{y}{6} - \frac{y^{5}}{10} + \frac{y}{21}\right]_0^1$$

$$= \left[\frac{1}{6} - \frac{1}{10} + \frac{1}{21} - 0\right]$$

$$= 4/35$$

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(2) $$\int_{z=0}^{z=2}\int_{y=1}^{y=2}\int_{x=0}^{x=yz} xyz \, dx\,dy\,dz$$

$$= \int_{0}^{2}\int_{1}^{2}\left(\left[\frac{x^2}{2}\right] yz\right)_{0}^{yz} dy\,dz$$

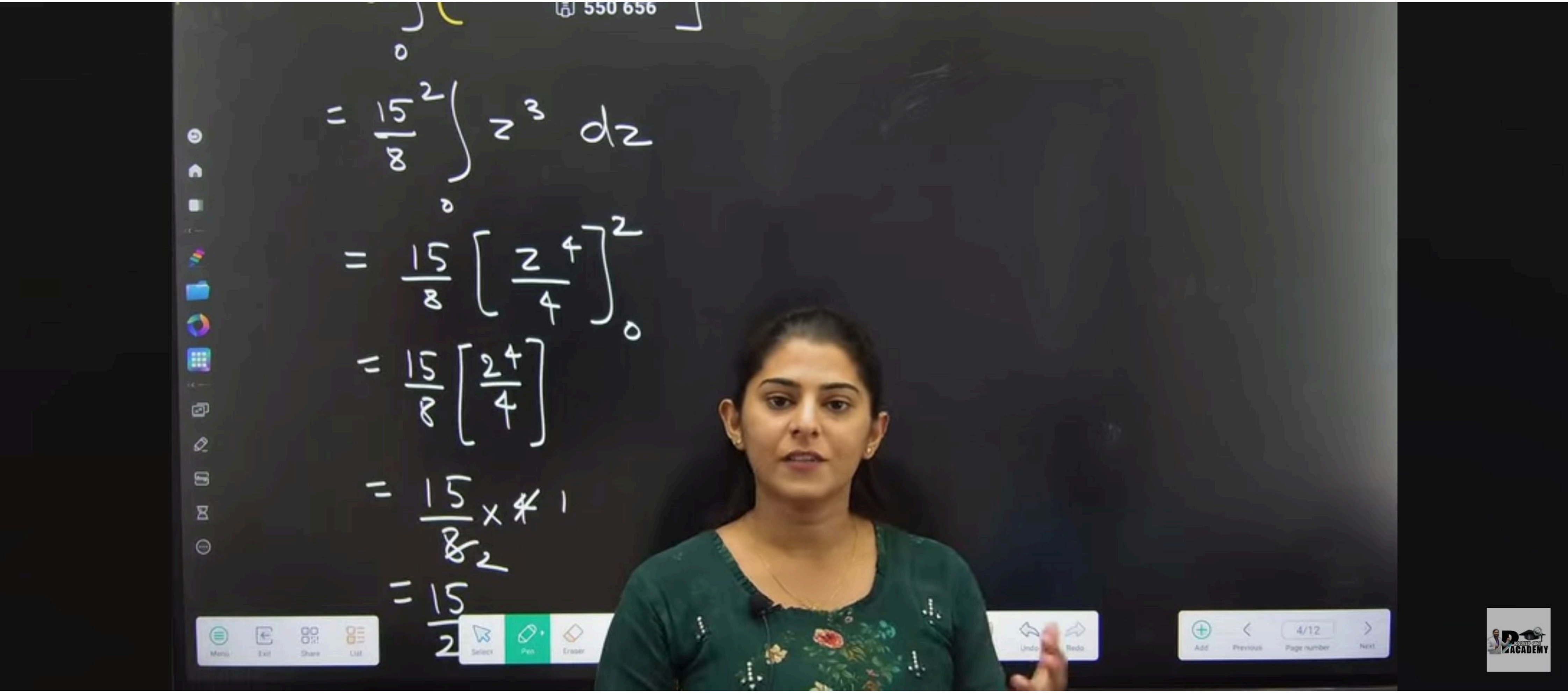
$$= \int_{0}^{2}\int_{1}^{2} \frac{(yz)^3}{2}$$

$$= \int_0^2 \int_1^2 \left(\left[\frac{x^2}{2}\right] yz \right)_0^{yz} dy\, dz$$

$$= \int_0^2 \int_1^2 \frac{y^3 z^3}{2}\, dy\, dz$$

$$= \frac{1}{8} \int_0^2 \left(\left[y^4 \right] z^3 \right)_1^2 dz$$

$$= \frac{1}{8} \int_0^2 \left[2^4 z^3 - z^3 \right]$$



550 656
$= \frac{15}{8}\int_0^2 z^3\,dz$
$= \frac{15}{8}\left[\frac{z^4}{4}\right]_0^2$
$= \frac{15}{8}\left[\frac{2^4}{4}\right]$
$= \frac{15}{\cancel{8}_2}\times \cancel{4}\,1$
$= \frac{15}{2}$
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③ $$\int_0^{\log 2}\int_0^{x}\int_0^{x+y} \underline{e^{x+y+z}}\ \underline{dz\,dy\,dx}$$

$x \quad y \quad z$

$$e^{x+y}\cdot e^{z}$$

$$\int_0^{\log 2}\int_0^{x} \left(e^{x+y}\, e^{z}\right)_0^{x+y} dy\,dx$$

550 656

$$\int_0^{x}\int_0^{y}\int_0^{z} \quad dz\,dy\,dx$$

$$e^{x+y}\cdot e^{z}$$

$$\int_0^{\log 2}\int_0^{x}\left(e^{x+y}\,e^{z}\right)_0^{x+y}\,dy\,dx$$

$$=\int_0^{\log 2}\int_0^{x} e^{x+y}\,e^{x+y}-e^{x+y}$$

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$$\int_0^{x}\int_0^{y}\int_0^{z} \quad dz\,dy\,dx$$

$$e^{x+y} \cdot e^{z}$$

$$\int_0^{\log 2}\int_0^{x} \left(e^{x+y}\, e^{z}\right)_0^{x+y} dy\,dx$$

$$= \int_0^{\log 2}\int_0^{x} e^{2x+2y} - e^{x+y} \quad dy\,dx$$

550 656

$$= \int_0^{\log 2}\int_0^{x} \frac{e^{2x+2y}}{e^{2x}\cdot e^{2y}} - \frac{e^{x+y}}{e^{x}\cdot e^{y}} \, dy\, dx$$

$$= \int_0^{\log 2} \left[e^{2x} \frac{e^{2y}}{2} - e^{x} e^{y} \right]_0^{x}$$

$$= \int_0^{\log 2} \left[e^{2x} \cdot \frac{e^{2x}}{2} \right.$$

550 656

$$e^{2x} \cdot e^{2y} - e^{x} \cdot e^{y}$$

$$= \int_0^{\log 2} \left[e^{2x} \frac{e^{2y}}{2} - e^{x} e^{y} \right]_0^{x} dx$$

$$= \int_0^{\log 2} \left[\frac{e^{4x}}{2} - e^{2x} - \frac{e^{2x}}{2} + e^{x} \right] dx$$

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550 656

$$= \int_0^{\log 2} \left[\frac{e^{4x}}{2} - e^{2x} - \frac{e^{2x}}{2} + e^{x} \right] dx$$

$$= \left[\frac{e^{4x}}{8} - \frac{e^{2x}}{2} - \frac{e^{2x}}{4} + e^{x} \right]_0^{\log 2}$$

$$= \left[\frac{e^{4\log 2}}{8} - \frac{e^{2\log 2}}{2} - \frac{e^{2\log 2}}{4} + e^{\log 2} \right] - \left[\frac{1}{8} - \frac{1}{2} - \frac{1}{4} + 1 \right]$$

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$$= \left[\frac{e^{4x}}{8} - \frac{e^{2x}}{2} - \frac{e^{2x}}{4} + e^{x}\right]_0^{\log 2}$$

$$= \left[\frac{e^{\overset{\log 2^4}{4\log 2}}}{8} - \frac{e^{\overset{\log 2^2}{2\log 2}}}{2} - \frac{e^{\overset{\log 2^2}{2\log 2}}}{4} + e^{\overset{\log 2^1}{\log 2}}\right] - \left[\frac{1}{8} - \frac{1}{2} - \frac{1}{4} + 1\right]$$

$$= \cancel{1} - \frac{1}{8} + \frac{1\times 2}{2\times 4} + \frac{1}{4} - \cancel{1}$$

$$= 5/8$$

026 368

(4) $$\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z} (x+y+z)\, dy\, dx\, dz$$

$z \quad x \quad y$

$$\int_{-1}^{1}\int_{0}^{z} \left[(x+z)^{(1)}+y\right] dy\, dx\, dz$$

026 368

$$= \int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}\left[(x+z)^{(1)}+y\right] dy\, dx\, dz$$

$$= \int_{-1}^{1}\int_{0}^{z}\left[(x+z)y+\frac{y^2}{2}\right]_{x-z}^{x+z} dx\, dz$$

$$\int^{1}\int_{0}^{z} (x+$$

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$$= \int_{-1}^{1}\int_{0}^{2} \left[(x+z)\,y + \frac{y^2}{2} \right]_{x-z}^{x+z} dx\,dz$$

$$= \int_{-1}^{1}\int_{0}^{2} (x+z)^2 + \frac{(x+z)^2}{2} - \left(x^2 - z^2 + \frac{(x-z)^2}{2} \right]$$

026 368

$$\int_{-1}^{1}\int_{0}^{z} (x+z)^2 + \frac{(x+z)^2}{2} - x^2+z^2 - \frac{(x-z)^2}{2} \, dx\, dz$$

$$\int_{-1}^{1}\int_{0}^{2} \frac{3(x+z)^2}{2} - x^2+z^2 - \frac{(x-z)^2}{2} \, dx\, dz$$

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$$\int_{-1}^{1}\int_{0}^{2} \frac{3(x+z)^2}{2} - x^2 + z^2 - \frac{(x-z)^2}{2}\, dx\, dz$$

$$= \int_{-1}^{1} \left[\frac{(x+z)^3}{2} - \frac{x^3}{3} + z^2 x - \frac{(x-z)^3}{6} \right]_0^2 dz$$

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$$\int_{-1}\int_{0} \frac{\cdots}{2} - \cdots z - \frac{(x-z)\cdots}{2}\, dx\, dz$$

$$= \int_{-1}^{1}\left[\frac{(x+z)^3}{2} - \frac{x^3}{3} + z^2 x - \frac{(x-z)^3}{6}\right]_0^{z} dz$$

$$\int^{1}\left(\frac{(2z)^3}{2} - \frac{z^3}{3} + z^3 - \left(\frac{z^3}{2} + \frac{z^3}{6}\right)\right) dz$$

$$\int_{-1}^{1}\int_{0}^{2} \frac{\quad}{2} - \quad z - \frac{(x-z)^2}{2} \, dx \, dz$$

026 368

$$= \int_{-1}^{1} \left[\frac{(x+z)^3}{2} - \frac{x^3}{3} + z^2 x - \frac{(x-z)^3}{6} \right]_0^2 dz$$

$$= \int_{-1}^{1} 4z^3 - \frac{z^3}{3} + z^3 - \frac{z^3}{2} - \frac{z^3}{6} \quad dz$$

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$$= \int_{-1} \left[\frac{\cdots}{2} \quad \frac{\cdots}{3} + z^2 x - \frac{(x-z)^3}{6} \right]_0^{z} dz$$

$$= \int_{-1}^{1} 4z^3 - \frac{z^3}{3} + z^3 - \frac{z^3}{2} - \frac{z^3}{6} \; dz$$

$$= \left[\frac{\cancel{4} z^4}{\cancel{4}} - \frac{z^4}{12} + \frac{z^4}{4} - \frac{z^4}{8} - \frac{z^4}{24} \right]_{-1}^{1}$$

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$$= \int_{-1} 4z^3 - \frac{z^3}{3} + z^3 - \frac{z^3}{2} - \frac{z^3}{6} \, dz$$

$$= \left[\frac{\cancel{4} z^4}{\cancel{4}} - \frac{z^4}{12} + \frac{z^4}{4} - \frac{z^4}{8} - \frac{z^4}{24} \right]_{-1}^{1}$$

$$= 1 - \frac{1}{12} + \frac{1}{4} - \frac{1}{8} - \frac{1}{24} - 1 + \frac{1}{12} - \frac{1}{4} + \frac{1}{8} + \frac{1}{24}$$

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$$= \int_{-1}^{1} \left(4z^3 - \frac{z^3}{3} + z^3 - \frac{z^3}{2} - \frac{z^3}{6} \right) dz$$

$$= \left[\frac{\cancel{4} z^4}{\cancel{4}} - \frac{z^4}{12} + \frac{z^4}{4} - \frac{z^4}{8} - \frac{z^4}{24} \right]_{-1}^{1}$$

$$= \cancel{1} - \cancel{\tfrac{1}{12}} + \cancel{\tfrac{1}{4}} - \cancel{\tfrac{1}{8}} - \cancel{\tfrac{1}{24}} - \cancel{1} + \cancel{\tfrac{1}{12}} - \cancel{\tfrac{1}{4}} + \cancel{\tfrac{1}{8}} + \cancel{\tfrac{1}{24}}$$

$$= 0$$