```
a_1 := -1;
b_1 := 1;
a_2 := -sqrt(1-x_1^2);
b_2 := sqrt(1-x_1^2);
a_3 := -sqrt(1-x_1^2-x_2^2);
b_3 := sqrt(1-x_1^2-x_2^2);

f := 1;
I_3 := int(f, x_3=a_3..b_3);
I_2 := int(I_3, x_2=a_2..b_2);
I_1 := int(I_2, x_1=a_1..b_1);

f := x_3^3 * cos(x_1+x_2);
I_3 := int(f, x_3=a_3..b_3);
I_2 := int(I_3, x_2=a_2..b_2);
I_1 := int(I_2, x_1=a_1..b_1);

f := cos(x_3) * cos(x_1+x_2);
I_3 := int(f, x_3=a_3..b_3);
I_2 := int(I_3, x_2=a_2..b_2);
I_1 := int(I_2, x_1=a_1..b_1);
evalf(I_1);
```

$$a\_1 := -1$$

$$b\_1 := 1$$

$$a\_2 := -sqrt\left(1 - x\_1^2\right)$$

$$b\_2 := sqrt\left(1 - x\_1^2\right)$$

$$a\_3 := -sqrt\left(1 - x\_1^2 - x\_2^2\right)$$

$$b\_3 := sqrt\left(1 - x\_1^2 - x\_2^2\right)$$

$$f := 1$$

$$I\_3 := 2\,sqrt\left(1 - x\_1^2 - x\_2^2\right)$$

$$I\_2 := -\left(-1 + x\_1^2\right)\pi$$

$$I\_1 := 4/3\,\pi$$

$$f := x\_3^3 \cos\left(x\_1 + x\_2\right)$$

$$I\_3 := 0$$

$$I\_2 := 0$$

$$I\_1 := 0$$

$$f := \cos\left(x\_3\right)\cos\left(x\_1 + x\_2\right)$$

$$I\_3 := 2\,\sin\left(sqrt\left(1 - x\_1^2 - x\_2^2\right)\right)\cos\left(x\_1\right)\cos\left(x\_2\right) - 2\,\sin\left(sqrt\left(1 - x\_1^2 - x\_2^2\right)\right)\sin\left(x\_1\right)\sin\left(x\_2\right)$$

$$I\_2 := \int_{-sqrt\left(1-x\_1^2\right)}^{sqrt\left(1-x\_1^2\right)} 2\,\sin\left(sqrt\left(1 - x\_1^2 - x\_2^2\right)\right)\cos\left(x\_1\right)\cos\left(x\_2\right) - 2\,\sin\left(sqrt\left(1 - x\_1^2 - x\_2^2\right)\right)\sin\left(x\_1\right)\sin\left(x\_2\right)\,dx\_2$$

$$I\_1 \; := \; \int_{-1}^{1}\int_{-sqrt\left(1-x\_1^2\right)}^{sqrt\left(1-x\_1^2\right)} 2\,\sin\left(sqrt\left(1-x\_1^2-x\_2^2\right)\right)\cos\left(x\_1\right)\cos\left(x\_2\right) - 2\,\sin\left(sqrt\left(1-x\_1^2-x\_2^2\right)\right)\sin\left(x\_1\right)\sin\left(x\_2\right) dx\_2\,dx\_1$$

$$3.059562058$$