

# Øving 5 - Martin Skatvedt - MA0001

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10:53

1.k.5

$$v = \frac{4\pi}{3} r^3$$

$$\omega) \quad r = R_0 \rightarrow \frac{4\pi}{3} R_0^3$$

$$r = 2R_0 \rightarrow \frac{4\pi}{3} (2R_0)^3 = \frac{32\pi}{3} R_0^3$$

$$r = 3R_0 \rightarrow \frac{4\pi}{3} (3R_0)^3 = \frac{108\pi}{3} R_0^3$$

I) Absolutt:

$$\frac{32\pi}{3} R_0^3 - \frac{4\pi}{3} R_0^3 = \frac{\pi R_0^3 (32 - 4)}{3} = \underline{\underline{\frac{28\pi}{3} R_0^3}}$$

Relativ:

$$\frac{\frac{32\pi}{3} R_0^3}{\frac{4\pi}{3} R_0^3} = \frac{32\pi R_0^3}{4\pi R_0^3} \cdot \frac{3}{3} = \frac{32}{4} = 8 = \underline{\underline{800\%}}$$

II)

Absolutt:

$$\frac{108\pi}{3} R_0^3 - \frac{4\pi}{3} R_0^3 = \frac{\pi R_0^3 (108 - 4)}{3} = \underline{\underline{\frac{104\pi}{3} R_0^3}}$$

Relativ:

$$\frac{\frac{108\pi}{3} R_0^3}{\frac{4\pi}{3} R_0^3} = \frac{108}{4} = 27 = \underline{\underline{2700\%}}$$

$$b) \quad v = \frac{4\pi}{3} r^3 \rightarrow r^3 = \frac{3V}{4\pi} \rightarrow r = \sqrt[3]{\frac{3V}{4\pi}}$$

$$v = v_0 \rightarrow \sqrt[3]{\frac{3v_0}{4\pi}}$$

$$v = 2v_0 \rightarrow \sqrt[3]{\frac{6v_0}{4\pi}}$$

$$v = 3v_0 \rightarrow \sqrt[3]{\frac{9v_0}{4\pi}}$$

I) Absolutt:

$$E_A = \sqrt[3]{\frac{6v_0}{4\pi}} - \sqrt[3]{\frac{3v_0}{4\pi}} \rightarrow E_A^3 = \frac{6v_0}{4\pi} - \frac{3v_0}{4\pi} \rightarrow E_A^3 = \frac{3v_0}{4\pi}$$

$$E_A = \sqrt[3]{\frac{3v_0}{4\pi}}$$

Relativ

$$E_R = \frac{\sqrt[3]{\frac{6v_0}{4\pi}}}{\sqrt[3]{\frac{3v_0}{4\pi}}} = \frac{6v_0}{4\pi} \cdot \frac{4\pi}{3v_0} = 2 = \underline{\underline{200\%}}$$

II) Absolutt:

$$E_A = \sqrt[3]{\frac{9v_0}{4\pi}} - \sqrt[3]{\frac{3v_0}{4\pi}} = \sqrt[3]{\frac{6v_0}{4\pi}} = \sqrt[3]{\frac{v_0}{2\pi}}$$

Relativ:

$$E_R = \frac{\sqrt[3]{\frac{9v_0}{4\pi}}}{\sqrt[3]{\frac{3v_0}{4\pi}}} = \frac{9}{3} = 3 = \underline{\underline{300\%}}$$

1.k.6

a)  $A \rightarrow (3,17)A$

I)  $3,17A - A = A(3,17 - 1) = \underline{\underline{2,17}}$

II)  $\frac{3,17A}{A} = \underline{\underline{3,17}} = \underline{\underline{317\%}}$

III)  $\frac{3,17A}{A} = \underline{\underline{3,17}}$

b)  $r: 10 \text{ cm} \rightarrow r: 10,2 \text{ cm}$

I)  $\frac{10,2 - 10}{10} \cdot 100 = \frac{0,2}{10} \cdot 100 = \underline{\underline{2\%}}$

II)  $O_k = 4\pi r^2$

$O_k(10 \text{ cm}) = 4\pi (10)^2 = \underline{\underline{400\pi \text{ cm}^2}}$

$O_k(10,2 \text{ cm}) = 4\pi (10,2)^2 = \underline{\underline{416,16\pi \text{ cm}^2}}$

$\frac{416,16 - 400}{400} \cdot 100 = \frac{16,16}{400} \cdot 100 = \underline{\underline{4,04\%}}$

III)  $V_k = \frac{4\pi}{3} r^3$

$V_k(10 \text{ cm}) = \frac{4\pi}{3} (10)^3 = \underline{\underline{1333,333\pi \text{ cm}^3}}$

$V_k(10,2 \text{ cm}) = \frac{4\pi}{3} (10,2)^3 = \underline{\underline{1414,944\pi \text{ cm}^3}}$

$\frac{1414,944 - 1333,333}{1333,333} \cdot 100 = \underline{\underline{6,12\%}}$

(2.k.1.b)

$$f(x) = x^3 + 2$$

$$g(x) = \sqrt[3]{x-2}$$

$$f(\sqrt[3]{2}) = (\sqrt[3]{2})^3 + 2 = 2 + 2 = \underline{\underline{4}}$$

$$g(29) = \sqrt[3]{29-2} = \sqrt[3]{27} = \underline{\underline{3}}$$

$$f(g(10)) = (\sqrt[3]{10-2})^3 + 2 = 8 + 2 = \underline{\underline{10}}$$

$$g(f(2)) = \sqrt[3]{2^3 + 2 - 2} = \underline{\underline{2}}$$

$$f(g(x)) = (\sqrt[3]{x-2})^3 + 2 = x - 2 + 2 = \underline{\underline{x}}$$

$$g(f(x)) = \sqrt[3]{(x^3 + 2) - 2} = \sqrt[3]{x^3} = \underline{\underline{x}}$$

f og g er inverse av hverandre

(3.k.6)

$$a) f(t) = 3 \sin(3t) - 4 \cos(3t)$$

$$P_{ab} = (-4, 3) \quad r_{ab} = \sqrt{3^2 + (-4)^2} = \underline{\underline{5}}$$

$$\Theta = \arctan\left(\frac{3}{-4}\right) + \pi \approx -0,6435 + \pi \approx \underline{\underline{2,4980}}$$

$$\underline{\underline{f(t) = 5 \cos(3(t - 0,83))}}$$

$$b) f(t) = -2\sqrt{3} \sin(4t) + \sqrt{3} \cos(4t)$$

$$P_{ab} = (\sqrt{3}, -2\sqrt{3}) \quad r_{ab} = \sqrt{(-2\sqrt{3})^2 + (\sqrt{3})^2} = \underline{\underline{\sqrt{15}}}$$

$$\Theta = \frac{-2\sqrt{3}}{\sqrt{3}} = \underline{\underline{-2}}$$

$$\underline{\underline{f(t) = \sqrt{15} \cos(4(t + 0,13))}}$$

$$c) f(t) = -4 \cos(5t) - 3 \sin(5t)$$

$$p_{ab} = (-4, -3) \quad r_{ab} = \sqrt{(-4)^2 + (-3)^2} = \underline{5}$$

$$\theta = \arctan \frac{-3}{-4} + \pi \approx 0,6435 + \pi \approx \underline{3,7850}$$

$$\underline{f(t) = 5 \cos(5t - 0,76)}$$