

### Problem 1: Numbers

Calculate as integres or simplified fractions:

a)  $4 + \frac{2 \cdot 5}{2+1} \cdot 3$

b)  $7 \cdot \frac{2+1}{14} - 2^2$

c)  $\frac{2}{2+1} + \sqrt{2^4}$

d)  $7 - (1+2)^{2+1}$

e)  $\frac{7^{-1}}{7^{-2}}$

f)  $(\sqrt{3} - \sqrt{2})^2$

g)  $(5 + \sqrt{24})(5 - \sqrt{24})$

h)  $\sin(\frac{\pi}{2}) + \sin(\frac{5\pi}{2})$

i)  $(\cos(\frac{\pi}{3}))^2 + 9 + (\sin(\frac{\pi}{3}))^2$

### Problem 2: Parentheses

Calculate the parentheses and reduce the expression (if possible):

a)  $(x^2 + 2)^2$

b)  $(a + 4)^2(3 - a^2)$

c)  $\frac{1}{a} + \frac{1}{a-1}$

d)  $6x^2 - (2x^2 - 3x - 2^2x) - (x+1)(x+2)$

e)  $(x^{-2})^{-3}$

### Problem 3: Equations

Udregn parenteserne og reducér (hvis det er muligt):

a)  $8x - 1 = 7x + 1$

b)  $\frac{2}{x} = -\frac{3}{x+1}$

c)  $2x^2 - 3x = 1$

d)  $e^{x-4} - e = 0$

e)  $\ln(x^2 - 3) = 0$

#### Problem 4: Vectors

Let  $\vec{a} = (-1, 1, 0)$ ,  $\vec{b} = (3, \sqrt{2}, -2)$  and  $\vec{c} = (2, 0, t)$

- Calculate  $3\vec{b} - 4\vec{a}$
- Calculate the dotproduct (scalarproduct)  $\vec{a} \cdot \vec{b}$
- Determine  $t$  so  $\vec{b}$  og  $\vec{c}$  are orthogonal.

#### Problem 5: Derivatives

Find the derivative of the following functions

- $f(x) = 2x^3 + 4x^{-1} - 2$
- $g(x) = 2\sqrt{3}x + \sqrt{x}$
- $h(x) = 2xe^x + x^2$
- $k(x) = \cos(2x) - e^{2x}$

#### Problem 6: Integrals

Calculate the following integrals

- $\int 3e^{-x} dx$
- $\int_0^1 2xe^{x^2} dx$
- $\int_1^2 \frac{2}{x} + x^2 dx$

#### Problem 7: Reduction of fractions

$a$  er et vilkårligt tal, som hverken er  $-1$  eller  $0$ .

Determine whether the following reductions are true (T) or false (F)

- $\frac{1}{1+a} = \frac{\sqrt{3}}{\sqrt{3} + \sqrt{3}a}$
- $\frac{1}{1+a} = \frac{a+1}{a^2 + 2a + 1}$
- $\frac{1}{1+a} = a^2 + \frac{1}{a^2}$

#### Problem 8: Functions

Let  $f(x) = x^2 + 1$  and  $g(x) = e^x$ . Determine the following functions:

- $f(x+1)$
- $f(g(x))$  (also written as  $f \circ g(x)$ )
- $3g(\ln(x))$