

### Problem 1: Numbers

Calculate as integers or simplified fractions:

a)  $3 + \frac{6}{2} \cdot 3$

b)  $\frac{1}{4} + \frac{2}{3}$

c)  $\frac{3}{4} + 3$

d)  $4 - 3(2 - 6)$

e)  $7^3 \cdot 7^7 \cdot \frac{-1}{7^{10}}$

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

g)  $\frac{2}{5}$

h)  $\sqrt{1 + (2\sqrt{2})^2}$

i)  $2 \sin(0) + \sin\left(\frac{\pi}{2}\right) - \cos\left(\frac{3\pi}{2}\right)$

### Problem 2: Parentheses

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

a)  $(x - 5)^2$

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

c)  $a^2 \cdot a^3 + (a - 1)$

d)  $(3x^2 - y^2) - (4x^2 - y^2)$

e)  $(x^2)^3$

### Problem 3: Equations

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

a)  $-4x + 1 = 13$

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

c)  $x^2 - 2x - 15 = 0$

d)  $\frac{4}{x} + x = 2x$

e)  $e^{x-4} - 1 = 0$

### Problem 4: Vectors

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

a) Calculate  $3\vec{b} - 4\vec{a}$

b) Calculate the dotproduct (scalarproduct)  $\vec{a} \cdot \vec{b}$

c) Determine  $t$  so  $\vec{b}$  og  $\vec{c}$  are orthogonal.

### Problem 5: Derivatives

Find the derivative of the following functions

- a)  $f(x) = 2x^2 + 4x - 2$
- b)  $g(x) = 2\sqrt{3}x$
- c)  $h(x) = 2x \sin(x)$
- d)  $k(x) = \sin(2x) - x$

### Problem 6: Integrals

Calculate the following integrals

- a)  $\int \cos(x) dx$
- b)  $\int_0^1 (2x^2 + x + 1) dx$
- c)  $\int_1^2 \frac{2}{x} dx$

### Problem 7: Reduction of fractions

Let  $a$  be an arbitrary number that is not  $-1$  or  $0$ .

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

- a)  $\frac{1}{1+a} = \frac{3}{3+a}$
- b)  $\frac{1}{1+a} = \frac{a}{a^2+a}$
- c)  $\frac{1}{1+a} = 1 + \frac{1}{a}$

### Problem 8: Functions

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

- a)  $f(x) + g(x)$
- b)  $f(g(x))$  (also written as  $f \circ g(x)$ )
- c)  $2f(x)$

### Problem 9: Trigonometry

The figures shows a unit circle and the angle  $x$ . Choose the one that is correct.

