

# Math exercises for revision

## Simplifications

Simplify the following expressions:

1.)  $\frac{(ax)^2 - a^2}{ax - a}$

2.)  $x(x - 1)(x + 3) - x^2(1 + x)$

3.)  $\ln(ax) + \ln(bx) - \ln(c)$

4.)  $\left(\frac{11x^{-3}}{4y^5}\right)^2 / \left(\frac{2}{y}\right)^{-3}$

5.)  $\sum_{i=1}^n 1?$

6.)  $\prod_{i=1}^n 1?$

## Equations

Solve the following equations for  $x$ :

7.)  $(x - 7)(x + 3) = x(x + 2) + 5$

8.)  $\frac{3x^2}{x-1} - 3x = \frac{3}{x-1} + 2$

9.)  $4x + 2y - 6x^2 - 3xy = (2 - 3x)(2x + y)$

10.)  $2x^2 - 7x + 3 = 0$

11.)  $x^3 - yx^2 = x - y$  (3 solutions!)

12.)  $\ln(a^x) = 1/2$

13.)  $a^{rx} = 100$

## Inequalities

Solve the following inequalities for  $x$ :

14.)  $-\frac{x}{3} + 5 > 15$

15.)  $\frac{2-x}{3} < \frac{4x-3}{2}$

16.)  $\frac{x+3}{2} < \frac{x+2}{-3}$

## Derivatives

Find the derivatives with respect to  $x$ :

17.)  $-x^2 + 8x - 12$

18.)  $\frac{1}{x^2+1}$

19.)  $e^{3x}$

20.)  $x^n + e^{ax}$

21.)  $x^n e^{ax}$

22.)  $\frac{ax^2}{1-x}$

23.)  $\ln(x)$

24.)  $\ln(ax^2)$

## Integrals

Determine the following integrals:

25.)  $\int 3x^2 dx$

26.)  $\int_{x=1}^2 8x^3 dx$

27.)  $\int_{x=0}^3 (2x + 1) dx$

28.)  $\int_{x=0}^{\infty} e^{-rx} dx$  (for  $r > 0$ )

## Limits

Determine the following limits:

29.)  $\lim_{x \rightarrow \infty} \frac{e^x}{x^{39874}}$

30.)  $\lim_{x \rightarrow \infty} \frac{3x^2+1}{2x^2-5}$

31.)  $\lim_{x \rightarrow 1} \frac{x^4-4}{x^3-1}$