

THE UNIVERSITY OF OSLO
Faculty of mathematics and natural sciences

Mid-term exam in MAT1000, 31/3-08.

MID-TERM EXAM IN: MAT1000 – MATEMATIKK I PRAKSIS I.
EXAM DATE: MONDAY 31/3, 2008.
TIME FOR EXAM: 09.00–11.00 AM.
ATTACHMENTS: NONE.
APPROVED HELPING MATERIAL: TEXTBOOK, TYPED AND HANDWRITTEN NOTES, APPROVED CALCULATOR, HANDBOOK OF FORMULAS.

THE EXAM TEXT RUNS OVER 2 PAGES.

CANDIDATE NUMBER. _____

Correct answer for each exercise gains the specified number of points. Wrong answer gives 0 points. No answer or multiple answers for the same exercise gain 0 points.

1) Which of the following points lies on the line with slope -5 going through the point $(1, 3)$? [2 points]

- $(0, 2)$ $(2, -2)$ $(\frac{1}{5}, -3)$ $(3, 1)$ $(2, -\frac{1}{5})$

2) The equation $\sqrt{x+3} = -3 - x$ has solution(s): [3 points]

- $x = -2$ and $x = -3$ $x = -2$ $x = -3$ $x = -4$ and $x = -3$

3) What is the biggest value the function $f(x, y) = 15x + 10y$ can attain on the plane domain determined by the inequalities

$$\begin{aligned}x &\geq 0 \\y &\geq 0 \\3y + x &\leq 9 \\y + 2x &\leq 6\end{aligned}$$

[3 points]

- 21 33 $\frac{502}{3}$ $\frac{304}{5}$ 51

4) The function $f(x) = \frac{9x^3+7x^2+3}{3x^3+2x+3}$ has horizontal asymptote [3 points]

- $y = 3$ $y = 1$ no horizontal asymptote $y = 0$

5) The function $f(x) = \frac{3x-2}{|x-1|-1}$ has vertical asymptote(s) [3 points]

- $x = 0$ and $x = 2$ $x = 0$ and $x = -1$ $x = -1$ $x = 2$

6) Halving time for ^{14}C is 5730 years. After how many years is the concentration of ^{14}C in a fossil tooth reduced with 80%? [2 points]

- 4584 $5730 \frac{\ln(0.8)}{\ln 0.5}$ $5730 \ln(0.4)$ $5730 \ln(0.8)$ $-5730 \frac{\ln(0.2)}{\ln(2)}$

7) A radioactive substance has halving time of 1500 year. After how many years is there 15% left of the substance? [2 points]

- $\frac{1500 \ln(15)}{\ln(0.5)}$ 4105 $1500 \ln(3)$ 3050

8) The second term in an infinite geometric series is $a_2 = \frac{6}{5}$ and the third term is $a_3 = \frac{18}{25}$. What is the sum of the series? [3 points]

- 10 $\frac{8}{5}$ $\frac{5}{2}$ 5

9) The limit $\lim_{x \rightarrow 0} \frac{\sin(6x)}{2x \cos x}$ equals: [3 points]

- 2 $\frac{1}{3}$ 0 3 12

10) The function f is a harmonic oscillation with amplitude 30, middle value 510, period 15 and acrophase 12. What is the expression for the function? [2 points]

- $30 + 510 \cos 15(t - 12)$
 $510 + 30 \cos 15(t - 12)$
 $510 + 30 \cos \frac{2\pi}{15}(t - 12)$
 $540 + 30 \cos \frac{2\pi}{15}(t - 12)$

11) The function $f(t) = -\frac{1}{4} \cos 3t - \frac{1}{3} \sin 3t$ is approximately equal: [3 points]

- $\frac{5}{12} \cos 3(t - 0.21)$ $\frac{25}{12} \cos 3(t - 0.31)$ $5 \cos(3t - 1)$ $\frac{5}{12} \cos 3(t - 1.36)$

12) The graph of an exponential function goes through the points $(1, 2)$ and $(3, \frac{2}{9})$. Which of the following five points is also on the graph? [3 points]

- $((-1, 2))$ $(2, 24)$ $(0, 3)$ $(-1, 18)$ $(1, \frac{2}{3})$

13) The graph of the function $f(x) = cx^r$ goes through the points $(1, 5)$ and $(8, 10)$. What is the function? [2 points]

- $f(x) = 11x^{0.34}$ $f(x) = 0.2x^{0.8}$ $f(x) = 5x^{\frac{1}{3}}$ $f(x) = 5^2$ $f(x) = \frac{5x}{7} - \frac{30}{7}$

END