Surname: .... Forename: .... MatrNo.: ....

Mock-Exam: Calculus 1

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Prof. Robert Heß, Jan 19th 2012, duration: 90 Min.

Result: .... of 62 points Mark: .... points.

Problem 1 (8 points)

Resolve the following complex expressions:

$$a = (1+2\mathrm{j})(3+4\mathrm{j}) \qquad b = \mathrm{Im}\left(\frac{2+\mathrm{j}}{1-\mathrm{j}}\right) \qquad c = (2+2\mathrm{j})^4 \qquad d = \sqrt[4]{-4}$$

Problem 2 (12 points)

Differentiate the following expressions:

$$a = \frac{\mathrm{d}}{\mathrm{d}x} e^{-2x} \qquad b = \frac{\mathrm{d}}{\mathrm{d}x}\left(e^{2x}\sin(2\pi x)\right) \qquad c = \frac{\mathrm{d}}{\mathrm{d}y}(x^2 - 3xy + 2y^2)$$

$$d = \frac{\mathrm{d}}{\mathrm{d}x}\left(\frac{x^2-4}{x^2-1}\right) \qquad e = \frac{\mathrm{d}^2}{\mathrm{d}x^2}\sin(e^x) \qquad f = \frac{\mathrm{d}^4}{\mathrm{d}x^4}\exp(2\pi\mathrm{j}x)$$

Problem 3 (18 points)

Separate the following function into partial fractions: $f(x) = \dfrac{x^2 - x - 1}{x^3 - 2x^2 - 4x + 8}$

Problem 4 (12 points)

For the function $f = \dfrac{\cos(x)}{x^2 - \frac{\pi}{2}x}$ search for discontinuities. What kind of poles are these? Are they removable?

Problem 5 (12 points)

Which of the following statements are true?

1. If a sequence (a_n) is a zero sequence, then the series $\sum_{k=0}^{\infty} a_n$ is convergent.
2. If a series is absolute convergent, then it is convergent.
3. If a sequence of partial sums is convergent, then the corresponding series is convergent.
4. If a series $\sum_{k=0}^{\infty} a_n$ is convergent, then the sequence (a_n) is a zero sequence.
5. If a series is convergent, then it is absolute convergent.
6. If a series is convergent, then its sequence of partial sums is convergent.