

NAME :

Open book, open notes, open computer, but closed mouth!
Write all answers on these sheets.

question	1	2	3	4	5	6	total
points							
maximum	20	15	15	20	15	15	100

1. Consider the polynomial $p = x^3 + 3x^2 + 8$. Give Maple commands (with output)

(a) to show that p is irreducible over the rational numbers :

(b) to factor p symbolically into a product of linear polynomials,
adding sufficiently many formal roots :

(c) to factor p numerically :

(d) to show the relation between the numerical and the symbolic factorization :

2. Execute the commands `restart; k := 3; sum(x[k], k=1..5);`

(a) Explain why the third command does not give the desired result.

(b) Modify **ONLY** the third command so that it returns $x_1 + x_2 + x_3 + x_4 + x_5$.

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3. The sequence $\frac{7}{5}, \frac{141}{100}, \frac{707}{500}, \frac{7071}{5000}, \frac{66441}{46981}$ gives rational approximations to $\sqrt{2}$.

When answering the questions below, also give the Maple commands used:

(a) How many decimal places in $\frac{66441}{46981}$ as rational approximation for $\sqrt{2}$ are correct?

(b) What is the next element in the sequence?

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4. Do $q := (x/y - 1)/(y/x - 1)$; and consider the expression assigned to q .

(a) Give the Maple command(s) (not the output!) to display the internal representation of this expression.

(b) Draw the directed acyclic graph which represents this expression.

(c) Explain the outcome of `subs(-1=+2,q)`. Why are all the divisions gone?

5. Let $r = \frac{x^{14}-8x^{12}+9x}{x^{13}+14x^7-3x^5}$.

Give all Maple commands and their output when answering the questions below.

(a) Convert r into a Horner form.

(b) Compared to the given form of r , how many arithmetical operations are gained when using the Horner form of r to evaluate r ?

(c) What is the most efficient way to evaluate r ?

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6. Consider the polynomials $p = x^2 - 7/4$ and $q = x^2 - 1.75$.

(a) Are these polynomials the same or are they different?

(b) Explain why the outcome of **factor** is then so different.

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