

MATH 56 WORKSHEET : arbitrary precision

Barnett
4/30/13

format : x length- N row vector representing $b^{N-1}x(1) + b^{N-2}x(2) + \dots + b^0x(N-1) + x(N)$
 [matlab indexing.

A) Finish the code to add arb. large x & y :

function $z = \text{add}(x, y, b)$ base.

$$n = \max(\text{numel}(x), \text{numel}(y)) + 1$$

$$x = [\text{zeros}(n - \text{numel}(x), 1) \ x]$$

$$y = [\text{zeros}(n - \text{numel}(y), 1) \ y]$$

$$z = x + y$$

} pad inputs to length n .

← elementwise add, now do the carrying to finish:

B) Write carry routine for case of subtraction $x - y$ for $x \geq y$:

C) Devise a floating point data format to extend the above to real numbers.

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SOLUTIONS em

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$z = x + y$

for $i = n:-1:2$

$c = \text{floor}(z(i)/b)$

$z(i) = z(i) - b*c$

$z(i-1) = z(i-1) + c$

end

} pad inputs to length n .

← elementwise add, now do the carrying to finish.

see code bigintadd.m online

B) Write carry routine for case of subtraction $x - y$ for $x \geq y$:

for $i = n:-1:2$

if $z(i) < 0$

$z(i) = z(i) + b$

$z(i-1) = z(i-1) - 1$

end

end

C) Devise a floating point data format to extend the above to real numbers.

Include exponent $e \in \mathbb{Z}$ st. rep is $b^e (b^{N-1}x^{(1)} + \dots + b^{N-1}x^{(N-1)} + x^{(N)})$.