James Halladay

Class Prep 4: 2.3.1 to 2.3.2

Chapter 2: Error Analysis

Section 2.3.3: Overflow and Underflow

```
library(cmna)
library(pracma)

##
## Attaching package: 'pracma'

## The following objects are masked from 'package:cmna':
##
##     cubicspline, horner, newton, nthroot, romberg, secant, wilkinson

.Machine$double.xmin

## [1] 2.225074e-308

.Machine$double.xmin / 2

## [1] 1.112537e-308

.Machine$double.xmax

## [1] 1.797693e+308

2147483647L * 2L

## Warning in 2147483647L * 2L: NAs produced by integer overflow

## [1] NA

2147483647L

## [1] 2147483647

.Machine$double.xmax * 2

## [1] Inf
```

Section 2.3.4: Error Propagation and Stability

Section 2.4.1: Simple Division Algorithms

```r
naivediv <- function(m, n) {
  quot <- 0
  r <- m

  if(n == 0)
    stop("attempted division by 0")

  while(r >= n) {
    quot <- quot + 1
    r <- r - n
  }

  return(list(quotient = quot, remainder = r))
}

naivediv(314, 7)

## $quotient
## [1] 44
##
## $remainder
## [1] 6

floor(314 / 7)

## [1] 44

314 %% 7

## [1] 6
```

Section 2.4.2: Binary Long Division

```r
longdiv <- function(m, n) {
  quot <- 0
  r <- 0

  if(n == 0)
    stop("Attempted division by 0")

  for(i in 31:0) {
    r <- bitwShiftL(r, 1)
    r <- r + bitwAnd(bitwShiftR(m, i), 1)
    if(r >= n) {
      r <- r - n
      quot <- quot + bitwShiftL(1, i)
    }
  }

  return(list(quotient = quot, remainder = r))
}


longdiv(314, 7)

## $quotient
## [1] 44
##
## $remainder
## [1] 6
```