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Class Prep 2: 1.3.2 to 2.1.2

library(cmna)

Chapter 1: Introduction to Numerical Analysis

Section 1.3.2: Evaluating Polynomials

```
naivepoly <- function(x, coefs) {
  y <- rep(0, length(x))

  for(i in 1:length(coefs)) {
    y <- y + coefs[i]*(x^(i-1))
  }

  return(y)
}


betterpoly <- function(x, coefs) {
  y <- rep(0, length(x))
  cached.x <- 1

  for(i in 1:length(coefs)) {
    y <- y + coefs[i] * cached.x
    cached.x <- cached.x * x
  }


  return(y)
}


horner <- function(x, coefs) {
  y <- rep(0, length(x))

  for(i in length(coefs):1) {
    y <- coefs[i] + x * y
  }

  return(y)
}
```

```
  f <- c(30, -19, -15, 3, 1)
  x <- c(-1, 0, 1)

  naivepoly(x, f)

## [1] 32 30  0

  betterpoly(x, f)

## [1] 32 30  0

  horner(x, f)

## [1] 32 30  0
```

Section 1.3.3: The nth Root Algorithm

```
nthroot <- function(a, n, tol = 1 / 1000 ) {
  x <- 1
  deltax <- tol * 10

  while(abs(deltax) > tol) {
    deltax <- (1/n) * (a / (x ^ (n - 1)) - x)
    x <- x + deltax
  }

  return(x)
}

nthroot(100, 2)

## [1] 10

nthroot(65536, 4)

## [1] 16

nthroot(1000, 3)

## [1] 10

nthroot(pi, 2)

## [1] 1.772454

100^.5

## [1] 10

65536^(1/4)

## [1] 16

1000^(1/3)

## [1] 10

pi^.5

## [1] 1.772454
```

Chapter 2: Error Analysis

Section 2.2.1: Binary Numbers

```
as.integer(2^31 - 2)

## [1] 2147483646

as.integer(2^31 - 1)

## [1] 2147483647

as.integer(2^31)

## Warning: NAs introduced by coercion to integer range

## [1] NA

-2147483646L

## [1] -2147483646

-2147483646L - 1L

## [1] -2147483647

-2147483646L - 2L

## Warning in -2147483646L - 2L: NAs produced by integer overflow

## [1] NA

-2147483646L

## [1] -2147483646

as.integer(0.5)

## [1] 0

as.integer(1.9)

## [1] 1

0xFACE

## [1] 64206
```

```
2^32

## [1] 4294967296

class(2^32)

## [1] "numeric"
```