Stats 102A - Homework 4

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Problem 1a

```r
a <- pqnumber(sign = 1, p = 3, q = 4, nums = 1:8)
b <- pqnumber(sign = 1, p = 6, q = 0, nums = c(3,9,5,1,4,1,3))
c <- pqnumber(sign = -1, p = 5, q = 1, nums = c(2,8,2,8,1,7,2))
is_pqnumber(a)
```

```
## [1] TRUE
```

```r
is_pqnumber(b)
```

```
## [1] TRUE
```

```r
is_pqnumber(c)
```

```
## [1] TRUE
```

```r
print(a)
```

```
## 87654.321
```

```r
print(b)
```

```
## 3.141593
```

```r
print(c)
```

```
## 27.18282
```

```r
as_pqnumber(3.14)
```

```
## $sign
## [1] 1
##
## $p
## [1] 2
##
## $q
## [1] 0
##
## $nums
## [1] 4 1 3
##
## attr(,"class")
## [1] "pqnumber"
```

```r
as_numeric(c)
```

```
## [1] -27.18282
```

Problem 1b

The subtraction and multiplication functions are eluding me…

```r
print(pq_add(a, b))
```

```
## 07657.462593
```

```r
cat("\n")
```

```r
print(pq_add(a, c))
```

```
## 07681.50382
```

```r
cat("\n")
```

```r
print(pq_add(b, c))
```

```
## 10.324413
```

Problem 2

```r
b <- my_sqrt(5)
b^2
```

```
## [1] 5
```

If we were to calculate an arbitrary root n for the number a we will be solving the root-finding problem for the equation $x^n - a$. In this case the iterative update becomes $x_{n+1} = x_n - \frac{x^n - a}{nx^{n-1}} = x - \frac{x}{n} + \frac{a}{nx^{n-1}}$.

```r
e <- my_root(7,n=5)
e^5
```

```
## [1] 7
```

The first four iterations are found with verbose=TRUE: 5.600583 4.481889 3.588981 2.879623 Calculating $e_1 \to e_4$ is subtracting 1.475773 from each: $e_1 = 4.12481$ $e_2 = 3.006116$ $e_3 = 2.113208$ $e_4 = 1.40385$ I calculated the ratio between these iterations and found that they slightly increased each time, meaning each iteration did relatively better than the last at squeezing in on the answer.