Kernel: SageMath 10.1

In [2]:
```
# Problem 1
result = N(sqrt(2) + e + pi)
result.nearby_rational(max_error=10**(-14))
```

Out[2]:
```
95029981/13064178
```

In [3]:
```
# Problem 2
c =
399339999714121134263218574566850518529794061938465942381076754746401249484393554050708152388260422760810117132571729535475464500130471164202365735617141197
(n,e) =
(735949021753953348445321809558616397418695897742383880582800546773031278111250106394599309830021845073209322240063188154790098436003564681620225342617878861,
638012627091397751315380695548991528112423045489885458408934082491728415514326044234606203325356953193732297565154673673107199246510305652182482941583262289)

cf = continued_fraction(e/n)

for i in range(1, len(cf)):
    guess = cf.convergent(i)
    phi = (e*denominator(guess) - 1) / numerator(guess)
    if denominator(phi) == 1:
        d = denominator(guess)
        print(i, d)
```

Out[3]:
```
1 1
2 7
57 98479442848435301791521650076432709
```

In [4]:
```
guess = cf.convergent(57)
d = 98479442848435301791521650076432709
b = -(n - phi + 1)
p = (-b + sqrt(b**2 - 4*n))/2
q = (-b - sqrt(b**2 - 4*n))/2

mod(c, n)**d
```

Out[4]:
```
24242404151420211905191301121204242424
```