```
s = 0.06; λμ = 0.455170 ; λqd = 42.472; λd = 0.053;
a = 1 / 3 (1 - s) ϕ Subscript[λ, d] - ϕ Subscript[λ, d] - Subscript[λ, μ]
```

$$-0.45517 - 0.0363933\,\phi$$

```
Simplify[a]
```

$$-0.45517 - 0.0363933\,\phi$$

```
b = 1 / 3 (1 - s) ϕ Subscript[λ, q] + ϕ Subscript[λ, qd]
```

$$42.472\,\phi + 0.313333\,\phi\,\lambda_q$$

```
c = 2 / 3 (1 - s) ϕ Subscript[λ, d]
```

$$0.0332133\,\phi$$

```
e = -ϕ Subscript[λ, q] + 2 / 3 (1 - s) ϕ Subscript[λ, q] - ϕ Subscript[λ, qd] - Subscript[λ, μ]
```

$$-0.45517 - 42.472\,\phi - 0.373333\,\phi\,\lambda_q$$

```
Clear[d]
```

```
λ1 = (a + e - (a^2 + 4 b c - 2 a e + e^2) ^0.5) / 2
```

$$\frac{1}{2}\left(-0.91034 - 42.5084\,\phi - 0.373333\,\phi\,\lambda_q - \left((-0.45517 - 0.0363933\,\phi)^2 - 2\,(-0.45517 - 0.0363933\,\phi)\,(-0.45517 - 42.472\,\phi - 0.373333\,\phi\,\lambda_q) + (-0.45517 - 42.472\,\phi - 0.373333\,\phi\,\lambda_q)^2 + 0.132853\,\phi\,(42.472\,\phi + 0.313333\,\phi\,\lambda_q)\right)^{0.5}\right)$$

```
FullSimplify[λ1]
```

$$-0.45517 - 21.2542\,\phi - 0.186667\,\phi\,\lambda_q - 0.5\,(0. + 1806.42\,\phi^2 + \phi^2\,(31.7269 + 0.139378\,\lambda_q)\,\lambda_q)^{0.5}$$

```
λ2 = (a + e + (a^2 + 4 b c - 2 a e + e^2) ^0.5) / 2
```

$$\frac{1}{2}\left(-0.91034 - 42.5084\,\phi - 0.373333\,\phi\,\lambda_q + \left((-0.45517 - 0.0363933\,\phi)^2 - 2\,(-0.45517 - 0.0363933\,\phi)\,(-0.45517 - 42.472\,\phi - 0.373333\,\phi\,\lambda_q) + (-0.45517 - 42.472\,\phi - 0.373333\,\phi\,\lambda_q)^2 + 0.132853\,\phi\,(42.472\,\phi + 0.313333\,\phi\,\lambda_q)\right)^{0.5}\right)$$

```
FullSimplify[λ2]
```

$$-0.45517 - 21.2542\,\phi - 0.186667\,\phi\,\lambda_q + 0.5\,(0. + 1806.42\,\phi^2 + \phi^2\,(31.7269 + 0.139378\,\lambda_q)\,\lambda_q)^{0.5}$$

```
X = ((a - e)^2 + 4 b c)^0.5
```

$$(0.132853\,\phi\,(42.472\,\phi + 0.313333\,\phi\,\lambda_q) + (0. + 42.4356\,\phi + 0.373333\,\phi\,\lambda_q)^2)^{0.5}$$

FullSimplify[X]

$$(0. + 1806.42\,\phi^2 + \phi^2\,(31.7269 + 0.139378\,\lambda_q)\,\lambda_q)^{0.5}$$

0.3333333333333333` $\left(\phi\left(\phi\left(-(2+s)\,\lambda_d + (1+2s)\,\lambda_q + 3\,\lambda_{qd}\right)^2 + 8\,(-1+s)\,\lambda_d\,\left((2+s)\,\phi\,\lambda_d + 3\,\lambda_\mu\right)\right)\right)^{0.5}$`

$$0.333333\,(\phi\,(-0.39856\,(1.36551 + 0.10918\,\phi) + \phi\,(127.307 + 1.12\,\lambda_q)^2))^{0.5}$$

X1 = ((a – e) – X) / (2 c)

$$\frac{1}{\phi}15.0542\,\Big(0. + 42.4356\,\phi + 0.373333\,\phi\,\lambda_q - (0.132853\,\phi\,(42.472\,\phi + 0.313333\,\phi\,\lambda_q) + (0. + 42.4356\,\phi + 0.373333\,\phi\,\lambda_q)^2)^{0.5}\Big)$$

FullSimplify[X1]

$$638.834 + 5.62023\,\lambda_q - \frac{1}{\phi}15.0542\,(0. + 1806.42\,\phi^2 + \phi^2\,(31.7269 + 0.139378\,\lambda_q)\,\lambda_q)^{0.5}$$

X2 = ((a – e) + X) / (2 c)

$$\frac{1}{\phi}15.0542\,\Big(0. + 42.4356\,\phi + 0.373333\,\phi\,\lambda_q + (0.132853\,\phi\,(42.472\,\phi + 0.313333\,\phi\,\lambda_q) + (0. + 42.4356\,\phi + 0.373333\,\phi\,\lambda_q)^2)^{0.5}\Big)$$

FullSimplify[X2]

$$638.834 + 5.62023\,\lambda_q + \frac{15.0542\,(0. + 1806.42\,\phi^2 + \phi^2\,(31.7269 + 0.139378\,\lambda_q)\,\lambda_q)^{0.5}}{\phi}$$

ϕ = 0.05

0.05

λ_q = 3.98

3.98

FullSimplify[X]

2.19938

FullSimplify[X1]

−0.994644

FullSimplify[X2]

1323.4

a1 = (2 X2 – 1) / (3 (X2 – X1))

0.665914

a2 = (1 – 2 X1) / (3 (X2 – X1))

0.000752366

FullSimplify[λ_1]

–2.65472

FullSimplify[λ_2]

–0.455338

Simplify[a – e]

2.19607

Simplify[X1]

–0.994644

Simplify[c]

0.00166067

Simplify[a]

–0.45699

Simplify[e]

–2.65306

FullSimmplify[((λ_d X1 + λ_q) (2 X2 – 1)) / ((λ_d X2 + λ_q) (1 – 2 X1))]

FullSimmplify[46.897]

FulSimplify[a1 / a2]

FulSimplify[885.094]