

```
syms x
```

```
E = 207e9
```

```
E = 2.0700e+11
```

```
d = piecewise( ...  
    x < 0.04, 0.035, ...  
    x < 0.1, 0.04, ...  
    x < 0.21, 0.045, ...  
    x < 0.275, 0.04, ...  
    0.035)
```

$$d = \begin{cases} \frac{7}{200} & \text{if } x < \frac{1}{25} \\ \frac{1}{25} & \text{if } x < \frac{1}{10} \\ \frac{9}{200} & \text{if } x < \frac{21}{100} \\ \frac{1}{25} & \text{if } x < \frac{11}{40} \\ \frac{7}{200} & \text{otherwise} \end{cases}$$

```
I = pi * d^4 / 64
```

$$I = \begin{cases} \frac{2401 \pi}{102400000000} & \text{if } x < \frac{1}{25} \\ \frac{\pi}{25000000} & \text{if } x < \frac{1}{10} \\ \frac{6561 \pi}{102400000000} & \text{if } x < \frac{21}{100} \\ \frac{\pi}{25000000} & \text{if } x < \frac{11}{40} \\ \frac{2401 \pi}{102400000000} & \text{otherwise} \end{cases}$$

```
M = piecewise( ...  
    x < 0.14, 3889 * x, ...  
    980 - 3111 * x)
```

$$M = \begin{cases} 3889 x & \text{if } x < \frac{7}{50} \\ 980 - 3111 x & \text{otherwise} \end{cases}$$

```

syms C1 C2
intrim = int( ...
    int( ...
        M / (E * I), ...
        x, 0, x) + C1, ...
    x, 0, x) + C2

```

```
intrim =
```

$$\left\{ \begin{array}{l}
 \frac{C_1}{10} + C_2 + \frac{291445549}{2982042000000 \pi} \\
 \frac{C_1}{25} + C_2 + \frac{995584}{116486015625 \pi} \\
 \frac{7 C_1}{50} + C_2 + \frac{22389093026207}{97825887810000000 \pi} \\
 \frac{11 C_1}{40} + C_2 + \frac{1345421088463423}{1252171363968000000 \pi} \\
 \frac{21 C_1}{100} + C_2 + \frac{116904711068071}{195651775620000000 \pi} \\
 \frac{11 C_1}{40} + C_2 + \frac{1345421088463423}{1252171363968000000 \pi} + \frac{C_1 (40 x - 11)}{40} - \frac{(40 x - 11) (222945509376000 x^2 - 14938}{83478090931200} \\
 \frac{C_1}{25} + C_2 + \frac{995584}{116486015625 \pi} + \frac{C_1 (25 x - 1)}{25} + \frac{3889 (25 x - 1) (1500625 x^2 + 600}{1863776250000 \pi} \\
 \frac{C_1}{10} + C_2 + \frac{291445549}{2982042000000 \pi} + \frac{C_1 (10 x - 1)}{10} + \frac{(10 x - 1) (19123177472000 x^2 + 1912317747}{3913035512400000 \pi} \\
 \frac{7 C_1}{50} + C_2 + \frac{22389093026207}{97825887810000000 \pi} + \frac{C_1 (50 x - 7)}{50} + \frac{(50 x - 7) (-25495930880000 x^2 + 2052508}{3260862927000000} \\
 \frac{21 C_1}{100} + C_2 + \frac{116904711068071}{195651775620000000 \pi} + \frac{C_1 (100 x - 21)}{100} - \frac{(100 x - 21) (81679102785000 x^2 - 6003}{13043451708000} \\
 \frac{995584 x^3}{7455105 \pi} + C_1 x + C_2
 \end{array} \right.$$

```

sol = solve([ ...
    subs(intrim, x, 0) == 0, ...
    subs(intrim, x, 0.315) == 0])

```

```

sol = struct with fields:
    C1: -8839001407596083/(1972169898249600000*pi)
    C2: 0

```

```
y = subs(intrim, sol)
```

```
y =
```

0

$$\begin{aligned}
 & - \frac{6911529766631171}{1972169898249600000 \pi} \\
 & - \frac{1683521461205719}{9860849491248000000 \pi} \\
 & - \frac{224598880472891}{563477113785600000 \pi} \\
 & - \frac{779217931897579}{4930424745624000000 \pi} \\
 & - \frac{129103011053147}{375651409190400000 \pi} \\
 & - \frac{8839001407596083 (40x - 11)}{78886795929984000000 \pi} - \frac{779217931897579}{4930424745624000000 \pi} - \frac{(40x - 11) (222945509376000 x^2 - 149381015961600 x + 7334118816079)}{8347809092086952273280000 \pi} \\
 & - \frac{3889 (25x - 1) (1500625 x^2 + 60025 x + 7486)}{1863776250000 \pi} - \frac{1683521461205719}{9860849491248000000 \pi} - \frac{8839001407596083}{4930424745624000000 \pi} \\
 & - \frac{(10x - 1) (19123177472000 x^2 + 1912317747200 x + 640283416067)}{3913035512400000 \pi} - \frac{6911529766631171}{19721698982496000000 \pi} \\
 & - \frac{(50x - 7) (-25495930880000 x^2 + 20525084876800 x + 248699156997)}{32608629270000000 \pi} - \frac{224598880472891}{563477113785600000 \pi} \\
 & - \frac{8839001407596083 (100x - 21)}{197216989824960000000 \pi} - \frac{129103011053147}{375651409190400000 \pi} - \frac{(100x - 21) (81679102785000 x^2 - 60036897315150 x + 762155997721)}{1304345170800000 \pi} \\
 & - \frac{995584 x^3}{7455105 \pi} - \frac{8839001407596083 x}{1972169898249600000 \pi}
 \end{aligned}$$

```
yp = diff(y, x)
```

$$\begin{aligned}
 y_p = & - \frac{222945509376000 x^2 - 149381015961600 x + 7334118816079}{2086952273280000 \pi} - \frac{8839001407596083}{1972169898249600000 \pi} - \frac{(40x - 11) (222945509376000 x^2 - 149381015961600 x + 7334118816079)}{8347809092086952273280000 \pi} \\
 & - \frac{3889 (1500625 x^2 + 60025 x + 7486)}{74551050000 \pi} - \frac{8839001407596083}{1972169898249600000 \pi} + \frac{3889 (25x - 1) (1500625 x^2 + 60025 x + 7486)}{1863776250000 \pi} \\
 & - \frac{19123177472000 x^2 + 1912317747200 x + 640283416067}{391303551240000 \pi} - \frac{6911529766631171}{19721698982496000000 \pi} + \frac{(10x - 1) (19123177472000 x^2 + 1912317747200 x + 640283416067)}{3913035512400000 \pi} \\
 & - \frac{-25495930880000 x^2 + 20525084876800 x + 248699156997}{652172585400000 \pi} - \frac{224598880472891}{563477113785600000 \pi} - \frac{(50x - 7) (-25495930880000 x^2 + 20525084876800 x + 248699156997)}{32608629270000000 \pi} \\
 & - \frac{8839001407596083}{19721698982496000000 \pi} - \frac{81679102785000 x^2 - 60036897315150 x + 762155997721}{1304345170800000 \pi} - \frac{(100x - 21) (81679102785000 x^2 - 60036897315150 x + 762155997721)}{1304345170800000 \pi} \\
 & - \frac{995584 x^2}{2485035 \pi} - \frac{8839001407596083}{1972169898249600000 \pi}
 \end{aligned}$$

```
disp(double(limit(yp, x, 0)))
```

-0.0014

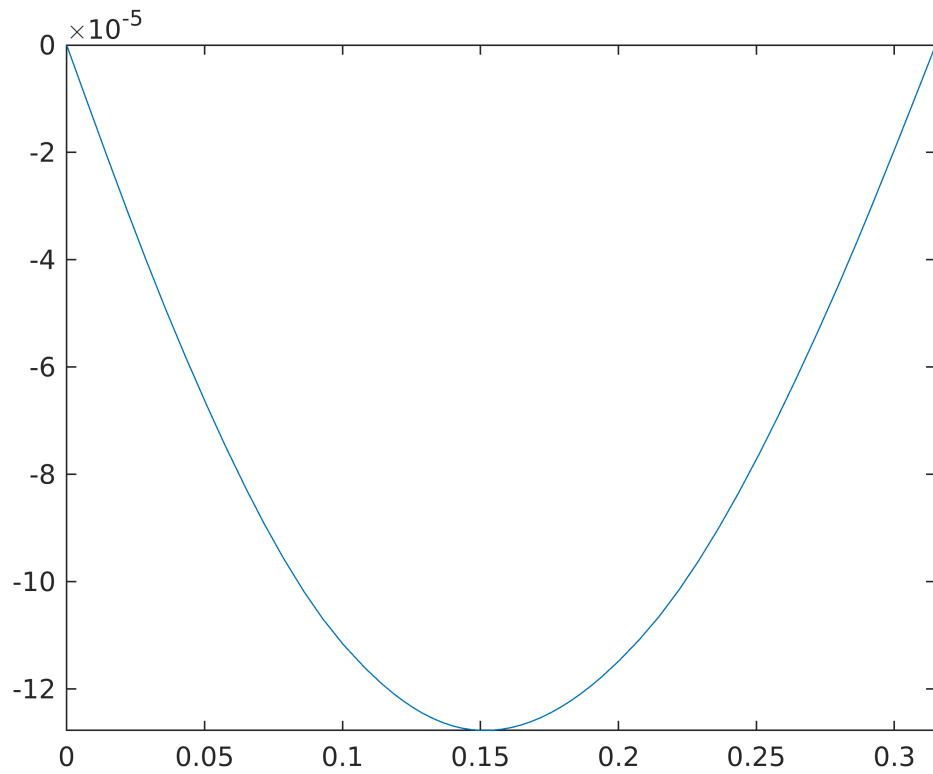
```
disp(double(limit(yp, x, 0.14)))
```

-1.4665e-04

```
disp(double(subs(yp, x, 0.315)))
```

0.0013

```
fplot(y, [0, 0.315])
```



```
fplot(yp, [0, 0.315])
```

