

```
(%i1) kill(all);
(%o1) done
```

1 Constant A

```
(%i6) m[p]: 1.672621777e-27;
      e: 1.602176565e-19;
      c: 2.99792458e8;
      epsilon[0]: 8.854187817e-12;
      M: 1.748/*+-3.495*/;
      r_0: 5.6402/2 * 0.0000000001;
```

ARRSTORE: use_fast_arrays=false; allocate a new property hash table for \$M

```
(%o1) 1.672621777 10-27
```

```
(e) 1.602176565 10-19
```

```
(c) 2.99792458 108
```

ARRSTORE: use_fast_arrays=false; allocate a new property hash table for \$EPSILON

```
(%o4) 8.854187817000001 10-12
```

```
(M) 1.748
```

```
(r_0) 2.8201 10-10
```

```
(%i7) A: 11*17*M*e^2/(4*pi*epsilon[0]*m[p]*c^2),numer;
```

```
(A) 5.01656031331026 10-16
```

2 Old note, Eq.(7) --> Eq.(16)

```
(%i8) kill(A);
```

```
(%o8) done
```

```
(%i9) E5: (2*m(r)-r*diff(m(r),r))*A=r^2*diff(m(r),r)*m(r);
```

```
(E5) 
$$A \left( 2 m(r) - r \left( \frac{d}{d r} m(r) \right) \right) = r^2 m(r) \left( \frac{d}{d r} m(r) \right)$$

```

```
(%i10) ode2(E5,m(r),r);
```

```
(%o10) 
$$r = \%c \%e^{\frac{2 \log(r m(r)) + 3 A}{3}}$$

```

```
(%i11) E16: solve(E5,m(r));
```

```
(E16) 
$$[ m(r) = - \frac{A r \left( \frac{d}{d r} m(r) \right)}{r^2 \left( \frac{d}{d r} m(r) \right) - 2 A} ]$$

```

```
(%i12) E20new: solve(E5,diff(m(r),r));
```

```
(E20new) 
$$[ \frac{d}{d r} m(r) = \frac{2 A m(r)}{r^2 m(r) + A r} ]$$

```

3 New note 332(3)

```
(%i13) E10: A*m(r)/r^2 = m(r)*diff(m(r),r)/(2*m(r)-r*diff(m(r),r));
```

```
(E10) 
$$\frac{A m(r)}{r^2} = \frac{m(r) \left( \frac{d}{d r} m(r) \right)}{2 m(r) - r \left( \frac{d}{d r} m(r) \right)}$$

```

```
(%i14) E10a: E10*r^2*(2*m(r)-r*(diff(m(r),r,1)))/m(r);
```

```
(E10a) 
$$A \left( 2 m(r) - r \left( \frac{d}{d r} m(r) \right) \right) = r^2 \left( \frac{d}{d r} m(r) \right)$$

```

Error was in E5:

```
(%i15) ratsimp(E5-E10a);
```

```
(%o15) 
$$0 = (r^2 m(r) - r^2) \left( \frac{d}{d r} m(r) \right)$$

```

```
(%i16) E21: ode2(E10a,m(r),r);
```

```
(E21) m(r)=%c%e2A\left(\frac{\log(r)}{A}-\frac{\log(r+A)}{A}\right)
```

```
(%i17) solve(E10a,diff(m(r),r));
```

```
(%o17) [ $\frac{d}{dr}m(r)=\frac{2Am(r)}{r^2+Ar}$ ]
```

3.1 Plot of m(r)

```
(%i18) ev(E21, [%c=1, r=0.001, A=0.5]),numer;
```

```
(%o18) m(0.001)=3.984047872319236 10-6
```

```
(%i19) m1: ev(rhs(E21), [%c=1, A=.5]);
```

```
(m1) %e1.0(2.0 log(r)-2.0 log(r+0.5))
```

```
(%i20) dm1: diff(m1,r);
```

```
(dm1) 1.0\left(\frac{2.0}{r}-\frac{2.0}{r+0.5}\right)%e1.0(2.0 log(r)-2.0 log(r+0.5))
```

```
(%i21) wxplot2d([m1,dm1], [r,0,5], [y,0,1],  
[legend, "m(r)", "dm(r)/dr"])$
```

plot2d: expression

evaluates to non-numeric value somewhere in plotting range.

plot2d: expression evaluates to non-numeric value somewhere in plotting range.

```
(%t21)
```

