In[30]:=
```
$Assumptions = {m > 0, R > 0, R > 2 m}
```

Out[30]=
$$\{m > 0,\ R > 0,\ R > 2\,m\}$$

Do the integral for outside of the horizon

In[31]:=
```
Int1 = Integrate[-1 / (Sqrt[2 m / r] * (1 - 2 m / r)) + Sqrt[2 m / r] / (1 - 2 m / r), {r, R, 2 m}]
```

Out[31]=
$$-\frac{4\,m}{3} + \frac{\sqrt{2}\ R^{3/2}}{3\sqrt{m}}$$

In[32]:=
```
FullSimplify[-4 m / 3 + Sqrt[2] R^(3/2) / (3 Sqrt[m])]
```

Out[32]=
$$-\frac{4\,m}{3} + \frac{\sqrt{2}\ R^{3/2}}{3\sqrt{m}}$$

Take the limit as R→0

In[33]:=
```
Limit[-Int1, R → 0]
```

Out[33]=
$$\frac{4\,m}{3}$$

Do the integral

In[34]:=
```
Int = Integrate[-1 / Sqrt[2 m / r - 1], {r, 2 m, 0}]
```

Out[34]=
$$m\,\pi$$

Define the constants

In[35]:=
```
G = 6.674 * 10^(-11)
c = 2.88 * 10^(8)
m = 2 * 10^(30)
```

Out[35]=
$$6.674 \times 10^{-11}$$

Out[36]=
$$2.88 \times 10^{8}$$

Out[37]=
$$2\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000$$

Calculate the total time for the upper bound in seconds

In[38]:=
```
(Int * G) / (c ^ 2)
```

Out[38]=
```
5055.7
```