

Los valores de las constantes son:

$$\rho = -0.01$$

$$S_0 = 81$$

$$\sigma = 0.09$$

$$r = 0.08$$

$$-0.01$$

$$81$$

$$0.09$$

$$0.08$$

La solución exacta es :

$$u[S_, t_] := S - \frac{\sqrt{S_0}}{\rho} \left( \sqrt{S} \operatorname{Exp}\left[\frac{r + \frac{\sigma^2}{4}}{2} * t\right] + \frac{\sqrt{S_0}}{4} \operatorname{Exp}\left[\left(r + \frac{\sigma^2}{4}\right) * t\right] \right)$$

$$u[S, t]$$

$$900. \left( \frac{9 e^{0.082025 t}}{4} + e^{0.0410125 t} \sqrt{S} \right) + S$$

$$900 * 2.44234$$

$$2198.11$$

Observamos para el caso donde t=0

$$u[S, 0]$$

$$900. (2.25 + 1. \sqrt{S}) + S$$

Como podemos observar coincide con el u0 de ADM.

$$u0[x_, t_] :=$$

$$19.05 + 12.11 * x + 6.09 * x * x + 8.07 x * x * x + .24 x * x * x * x + .21 * x * x * x * x * x$$

$$u0[x, t]$$

$$19.05 + 12.11 x + 6.09 x^2 + 8.07 x^3 + 0.24 x^4 + 0.21 x^5$$

$$A0[S, t] := (D[D[u0[S, t], S], S])^2$$

$$A0[S, t]$$

$$(12.18 + 48.42 S + 2.88 S^2 + 4.2 S^3)^2$$

```
u1[S_, t_] :=
  -Integrate[-1/2 * σ^2 * S^2 * D[D[u0[S, t], S], S] + r * S * D[u0[S, t], S] - r, t] -
  ρ * σ^2 * (Integrate[-S^3 * A0[S, t], t])
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```
u1[S, t]
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$$-4.10063 t - \left( -0.08 + 0.91125 \sqrt{S} + 0.08 \left( 1 + \frac{450}{\sqrt{S}} \right) S \right) t$$

```
A1[S, t] := 2 * (D[D[u0[S, t], S], S]) * (D[D[u1[S, t], S], S])
```

```
A1[S, t]
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$$-\frac{4152.52 t}{S^3}$$

```
u2[S_, t_] :=
  -Integrate[-1/2 * σ^2 * S^2 * D[D[u1[S, t], S], S] + r * S * D[u1[S, t], S] - r, t] -
  ρ * σ^2 * (Integrate[-S^3 * A1[S, t], t])
```

```
u2[S, t]
```

$$0.08 t + 0.168177 t^2 + 0.756911 \sqrt{S} t^2 + 0.0032 S t^2$$

```
A2[S, t] := 2 * (D[D[u0[S, t], S], S]) * (D[D[u2[S, t], S], S]) + (D[D[u1[S, t], S], S])^2
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```
A2[S, t]
```

$$\frac{170.305 t^2}{S^3}$$

```
u3[S_, t_] :=
  -Integrate[-1/2 * σ^2 * S^2 * D[D[u2[S, t], S], S] + r * S * D[u2[S, t], S] - r, t] -
  ρ * σ^2 * (Integrate[-S^3 * A2[S, t], t])
```

```
u3[S, t]
```

$$0.08 t - 0.00459824 t^3 - 0.0103476 \sqrt{S} t^3 - 0.0000853333 S t^3$$

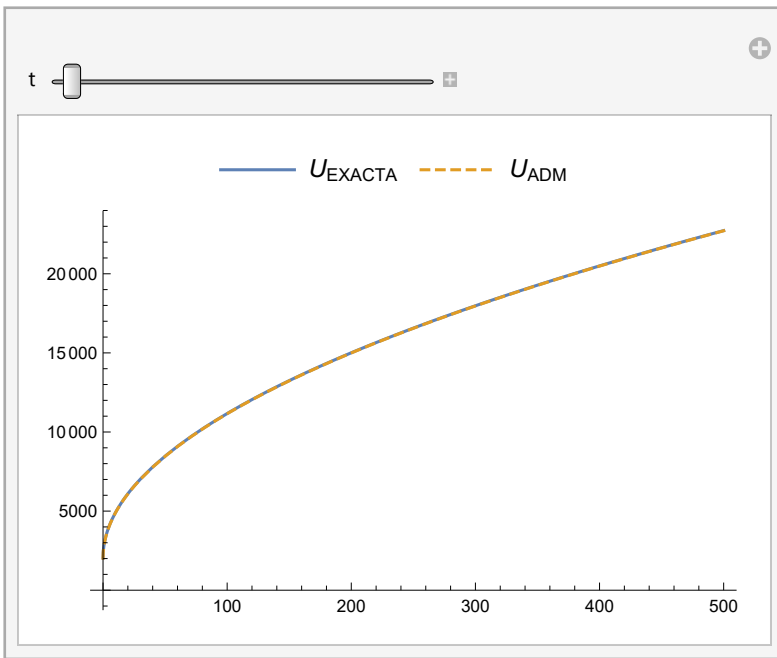
```
u[S_, t_] := u0[S, t] + u1[S, t] + u2[S, t] + u3[S, t]
```

```
u[S, t]
```

$$2025 + 900 \sqrt{S} + S - 3.94063 t - \left( -0.08 + 0.91125 \sqrt{S} + 0.08 \left( 1 + \frac{450}{\sqrt{S}} \right) S \right) t + 0.168177 t^2 +$$

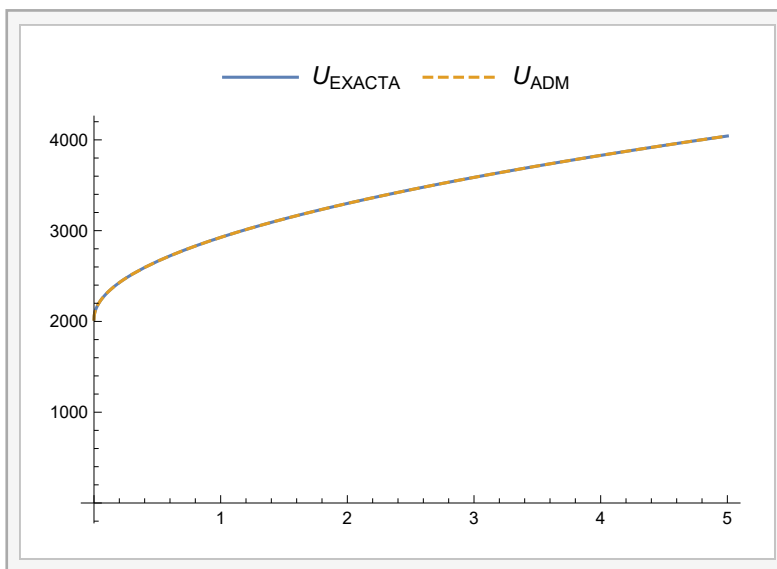
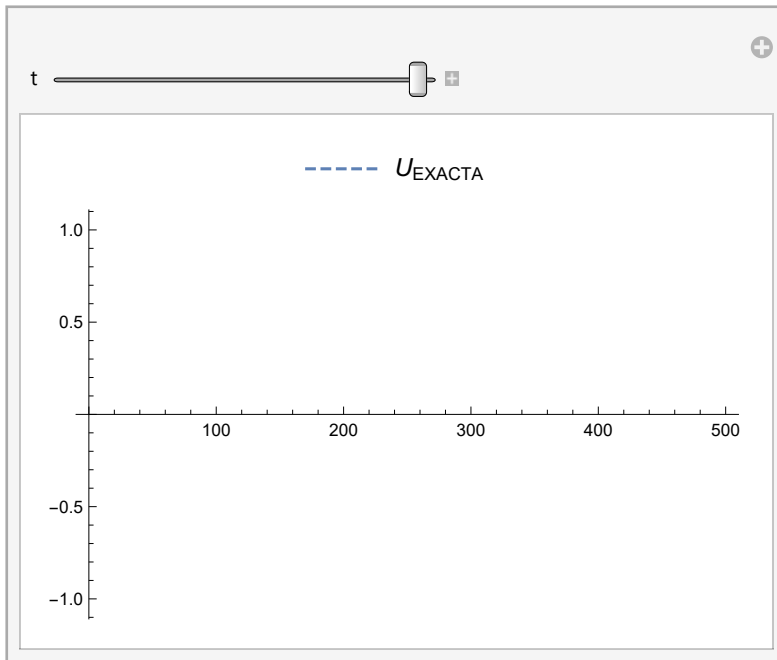
$$0.756911 \sqrt{S} t^2 + 0.0032 S t^2 - 0.00459824 t^3 - 0.0103476 \sqrt{S} t^3 - 0.0000853333 S t^3$$

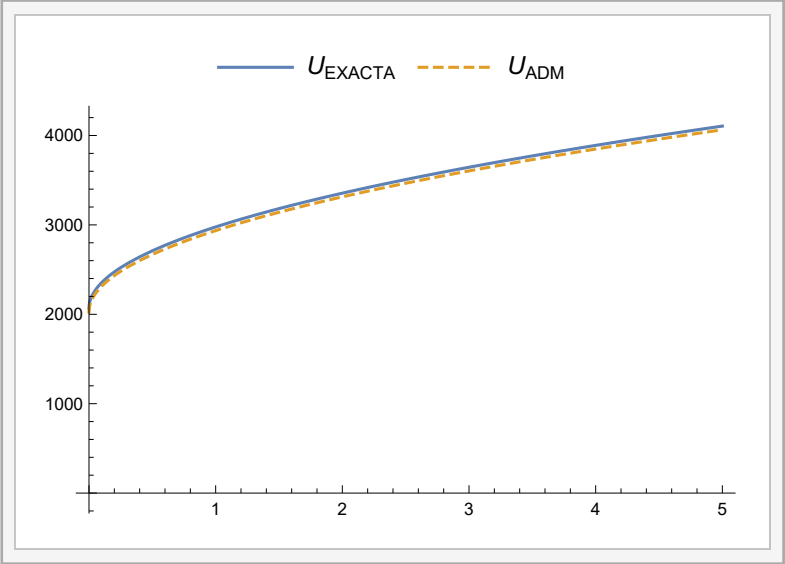
```
uA[S_, t_] := u[S, t]
```

$$\text{Manipulate}\left[\text{Plot}\left[\left\{\frac{9 e^{0.082025 t}}{4} + e^{0.0410125 t} \sqrt{S} + S - \left(-3.940625 t - \left(-0.08 + 0.91125 \sqrt{S} + 0.08 \left(1 + \frac{450}{\sqrt{S}}\right) S\right) t + 0.1681768828125 t^2 + 0.7569113203125 \sqrt{S} t^2 + 0.0032 S t^2 - 0.004598236270898439 t^3 - 0.010347608508105469 \sqrt{S} t^3 - 0.00008533333333333334 S t^3\right\}, \{S, 0, 500\}, \text{PlotLegends} \rightarrow \text{Placed}[\{\text{"U}_{\text{EXACTA}}", \text{"U}_{\text{ADM}}\}, \text{Above}], \text{PlotStyle} \rightarrow \{\text{Triangle}, \text{Dashed}\}, \text{AxesOrigin} \rightarrow \{0, 0\}], \{t, 0, 10\}\right]$$

$$u_A[S, t]$$

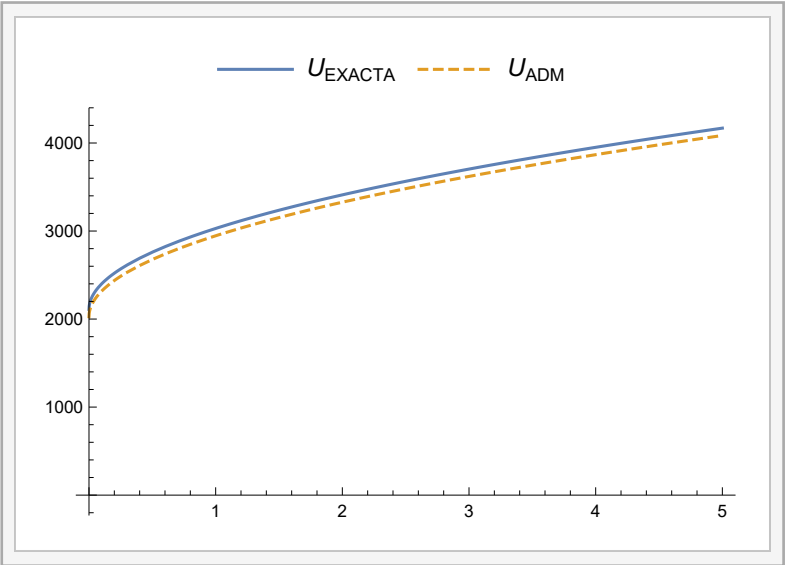
$$2025 + 900 \sqrt{S} + S - 3.94063 t - \left( -0.08 + 0.91125 \sqrt{S} + 0.08 \left( 1 + \frac{450}{\sqrt{S}} \right) S \right) t + 0.168177 t^2 + 0.756911 \sqrt{S} t^2 + 0.0032 S t^2 - 0.00459824 t^3 - 0.0103476 \sqrt{S} t^3 - 0.0000853333 S t^3$$

```
Manipulate[
  Plot[{U[S, t]}, {S, 0, 500}, PlotLegends → Placed[{"UEXACTA", "UADM"}, Above],
  PlotStyle → {Triangle, Dashed}, AxesOrigin → {0, 0}], {t, 0.1, 10}]
```

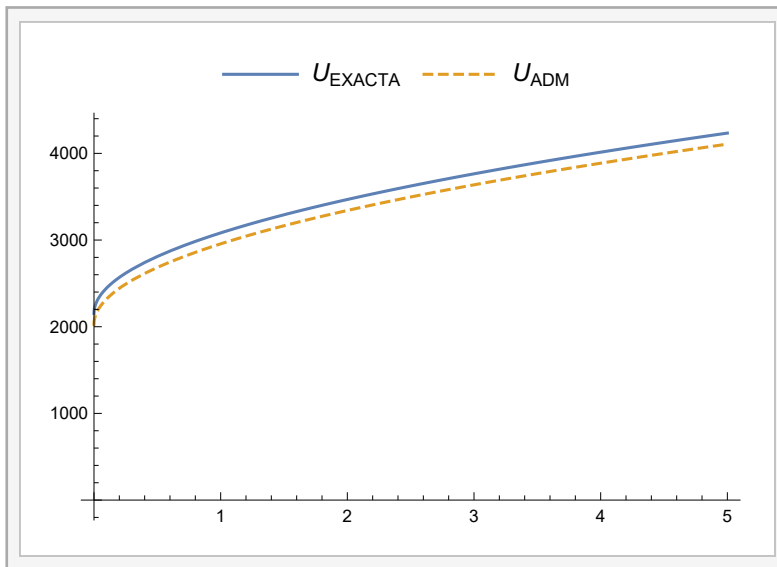




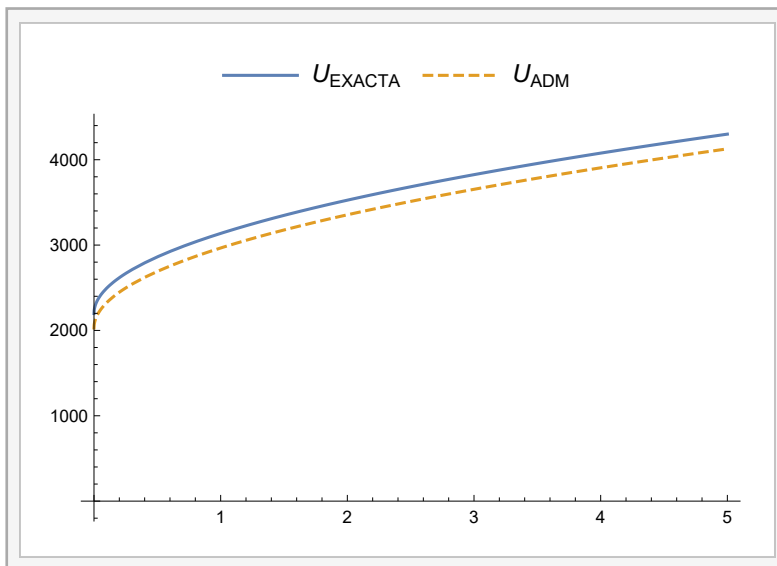
.25



5



75



1

```
In[16]:= f[x_] := 19.05 + 12.11 * x + 6.09 * x ^2 + 8.07 * x^3 + .24 * x^4 +
          .21 * x^5 + .084 * x^6 + .85 * x^7 + .75 * x^8 + .24 * x^9 + .57 * x^10
```

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In[17]:= f'[5]
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Out[17]= 1.25413 × 107
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In[18]:= f''[5]
```

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Out[18]= 2.21593 × 107
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In[19]:= f'''[5]
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Out[19]= 3.48532 × 107
```

```
In[20]:= f''''[5]
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Out[20]= 4.80331 × 107
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In[21]:= **f''''[5]**

Out[21]=  $4.80331 \times 10^7$

In[22]:= **Integrate[f[x], {x, 0, 5}]**

Out[22]=  $2.97222 \times 10^6$

In[10]:= **f[x\_] := 19.05 + 12.11 \* x + 6.09 x^2 + 8.07 \* x^3 + .24 \* x^4**

In[11]:= **f'[5]**

Out[11]= 798.26

In[12]:= **f''[5]**

Out[12]= 326.28

In[13]:= **f'''[5]**

Out[13]= 77.22

In[14]:= **f''''[5]**

Out[14]= 5.76

In[15]:= **Integrate[f[x], {x, 0, 5}]**

Out[15]= 1911.31