1.

```
4 + 2 Log[t] - 2 Log[3] + 4 Log[2] // Simplify
```

$$2\left(2 + \text{Log}\left[\frac{4\,t}{3}\right]\right)$$

```
y == 4 + 2 Log[x]
```

```
D[4 + 2 Log[x], x]
% /. x → 2 / 3
```

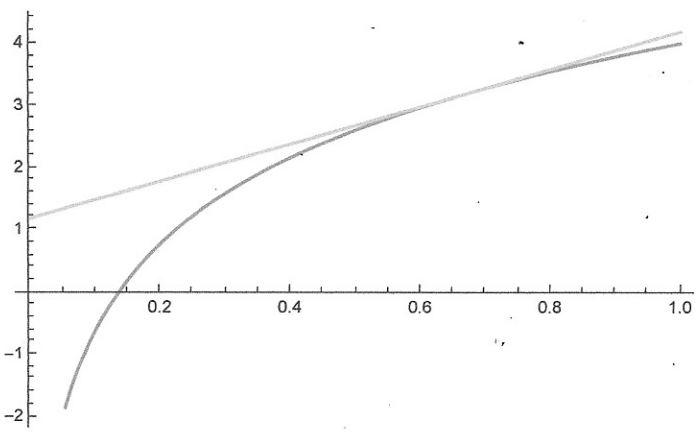
$$\frac{2}{x}$$

3

```
Solve[y - 4 - 2 Log[2 / 3] == 3 (x - 2 / 3), y][[1]]
```

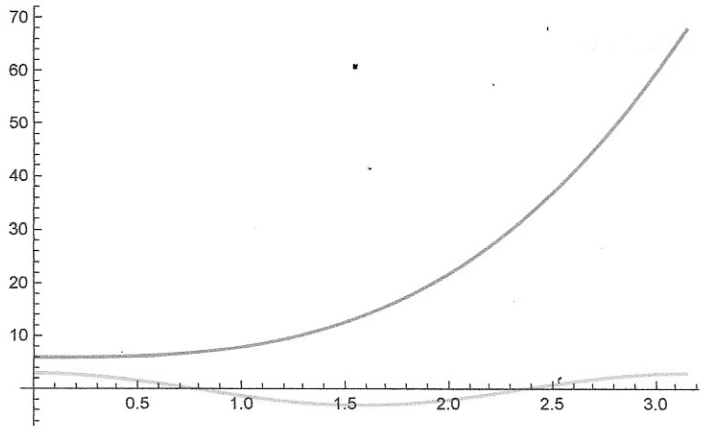
$$\left\{y \to 2 + 3\,x - 2\,\text{Log}\left[\frac{3}{2}\right]\right\}$$

```
Plot[{4 + 2 Log[x], 2 + 3 x + 2 Log[2 / 3]}, {x, 0, 1}]
```



2.

```
Plot[{2 t^3 + 6, 3 Cos[2 t]}, {t, 0, π}]
```




```
{2 t^3 + 6, 3 Cos[2 t]} /. t → 0
```

$\{6, 3\}$

```
{2 t^3 + 6, 3 Cos[2 t]} /. t → π
```

$\{6 + 2\pi^3, 3\}$

y is at the maximum value of 3 at both 0 and π.

The equation for *x* is not needed.

3.

```
(4 π)/3 (d/2)^3 // Simplify
```

$\frac{d^3 \pi}{6}$

```
Dt[(d^3 π)/6, t]
```

$\frac{1}{2} d^2 \pi \, \mathrm{Dt}[d, t]$

$$\frac{2 \times 10\ \mathrm{cm}^3 / \mathrm{min}}{\pi\ (40\ \mathrm{cm})^2}$$

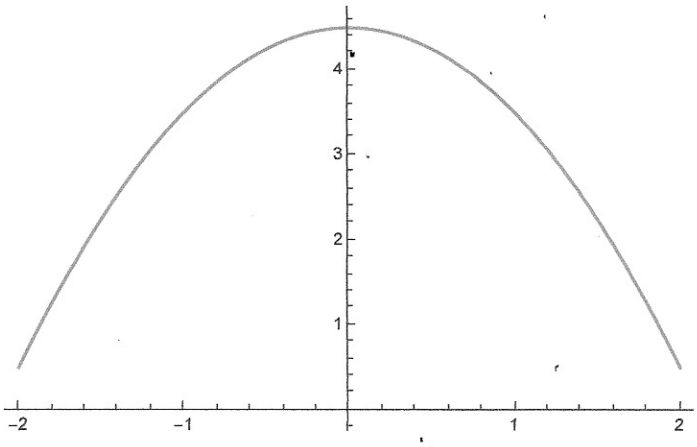
```
% // N
```

$$\frac{\mathrm{cm}}{80\ \mathrm{min}\ \pi}$$

$$\frac{0.00397887\ \mathrm{cm}}{\mathrm{min}}$$

4.

```
Plot[9/2 - x^2, {x, -2, 2}]
```




```
Integrate[π (9/2 - x^2)^2, {x, -2, 2}]
% // N
```

$$\frac{229\,\pi}{5}$$

```
143.885
```

5.

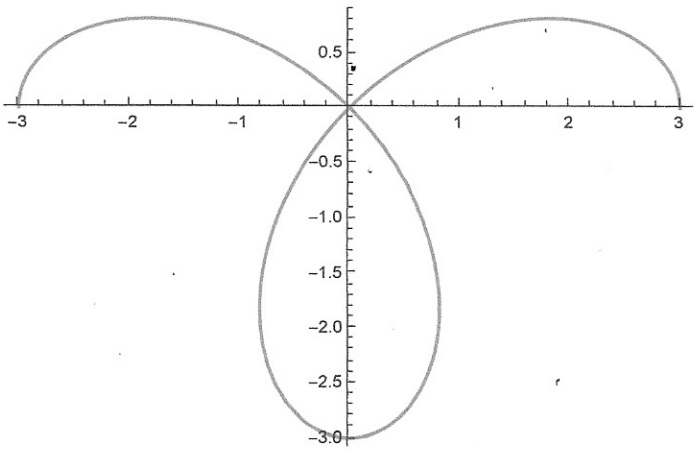
```
Integrate[e^(2 x), {x, 0, 2}]
% // N
```

$$\frac{1}{2}\left(-1+e^4\right)$$

```
26.7991
```

6.

```
PolarPlot[3 Cos[2 θ], {θ, 0, π}]
```




```
Dt[r Sin[θ], θ]
Dt[r Cos[θ], θ]
% /. r → 3 Cos[2 θ] // Simplify
% /. θ → π/2
```

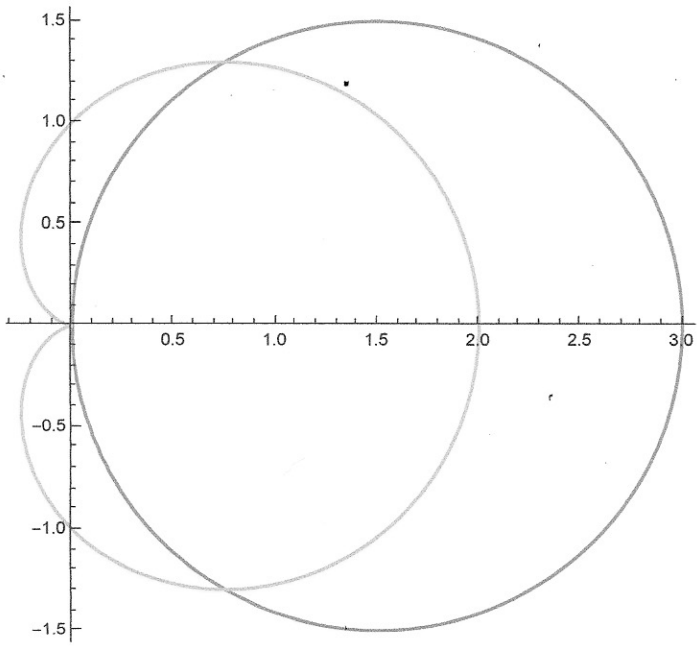
$$\frac{r\,\mathrm{Cos}[\theta] + \mathrm{Dt}[r, \theta]\,\mathrm{Sin}[\theta]}{\mathrm{Cos}[\theta]\,\mathrm{Dt}[r, \theta] - r\,\mathrm{Sin}[\theta]}$$

$$\frac{\mathrm{Cos}[\theta] - 3\,\mathrm{Cos}[3\,\theta]}{\mathrm{Sin}[\theta] + 3\,\mathrm{Sin}[3\,\theta]}$$

```
0
```

7.

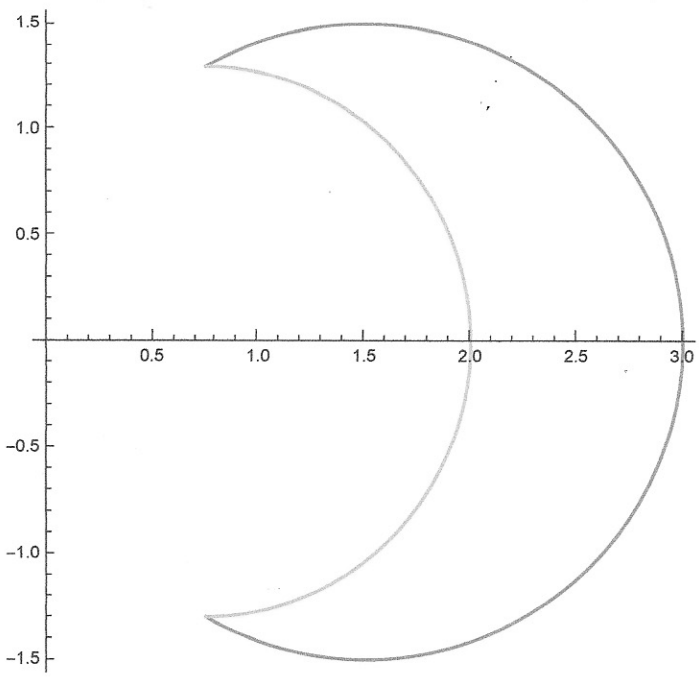
```
PolarPlot[{3 Cos[θ], 1 + Cos[θ]}, {θ, 0, 2 π}]
```



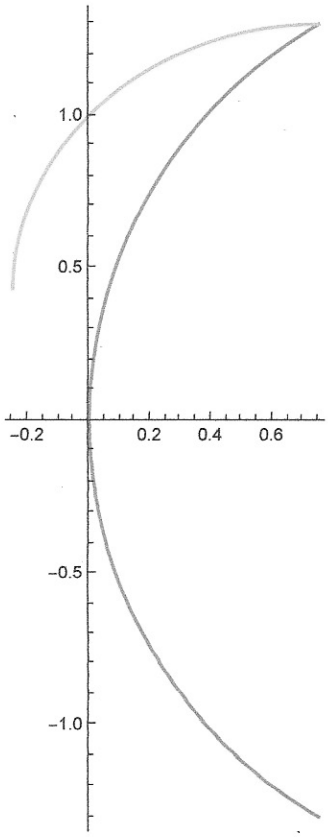

```
Reduce[3 Cos[θ] == 1 + Cos[θ], θ]
```

$$C[1] \in \text{Integers} \;\&\&\; \left(\theta == -\frac{\pi}{3} + 2\pi C[1] \;||\; \theta == \frac{\pi}{3} + 2\pi C[1]\right)$$

```
PolarPlot[{3 Cos[θ], 1 + Cos[θ]}, {θ, -π/3, π/3}]
```



```
PolarPlot[{3 Cos[θ], 1 + Cos[θ]}, {θ, π/3, 2π/3}]
```




```
1/2 Integrate[(3 Cos[θ])^2, {θ, π/3, 2π/3}] + 1/2 Integrate[(1 + Cos[θ])^2, {θ, -π/3, π/3}]
% // Expand
```

$$\frac{1}{2}\left(\frac{9\sqrt{3}}{4}+\pi\right)+\frac{1}{2}\left(-\frac{9\sqrt{3}}{4}+\frac{3\pi}{2}\right)$$

$$\frac{5\pi}{4}$$