Instructor:

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Solving and Visualizing a System of Differential Equations

```
> with(plots):
  de := [diff(x(t), t) = x(t) - y(t), diff(y(t), t) = x(t) + y(t)];
  sol := dsolve(de, [x(t), y(t)]);
  val := [c_1 = 1, c_2 = 1.5];
  sol2 := subs(val, sol);
```

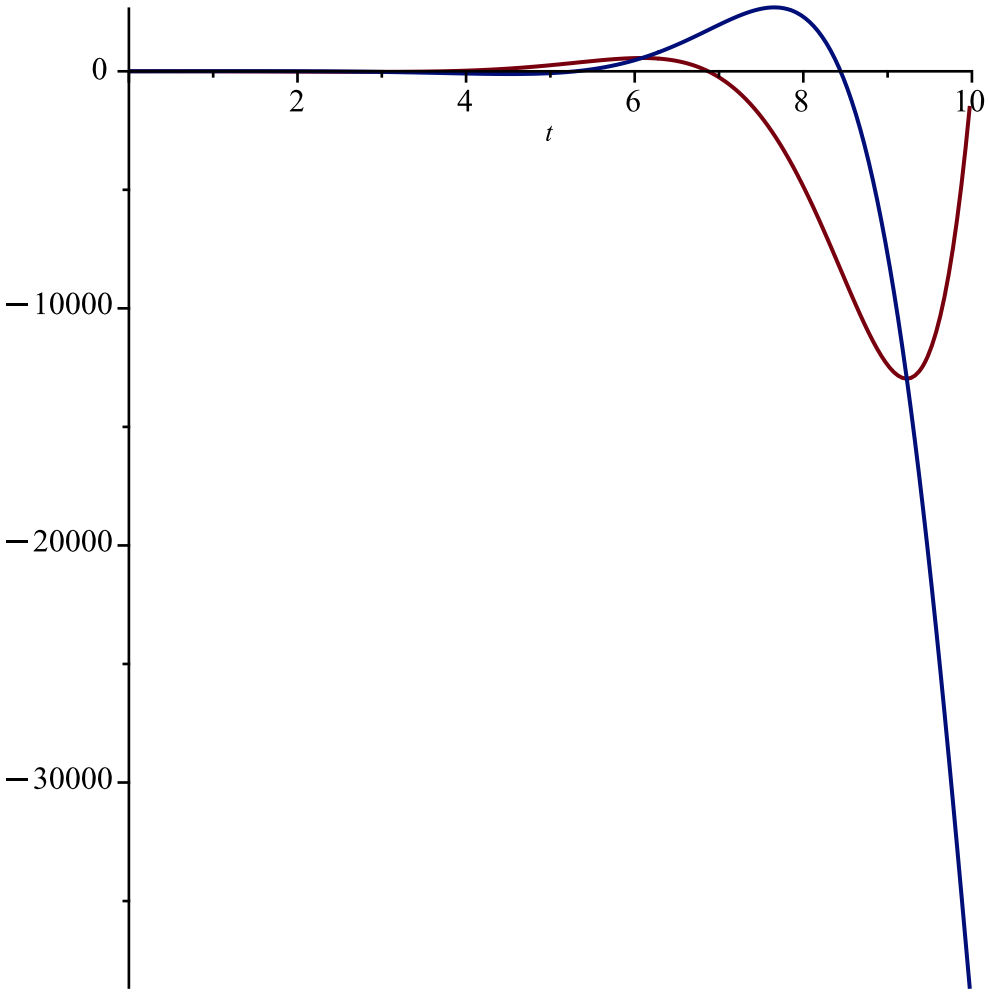
$$de := \left[\frac{d}{dt}x(t) = x(t) - y(t), \frac{d}{dt}y(t) = x(t) + y(t)\right]$$

$$sol := \left\{x(t) = e^{t}\left(\cos(t)\,c_1 - \sin(t)\,c_2\right), y(t) = e^{t}\left(c_2\cos(t) + c_1\sin(t)\right)\right\}$$

$$val := [c_1 = 1, c_2 = 1.5]$$

$$sol2 := \left\{x(t) = e^{t}\left(\cos(t) - 1.5\sin(t)\right), y(t) = e^{t}\left(1.5\cos(t) + \sin(t)\right)\right\} \quad \textbf{(1.1)}$$

```
> plot([rhs(sol2[1]), rhs(sol2[2])], t = 0..10)
```




```
>
```

Symbolic vs. Numeric Integration

```
> # Symbolic
  Int(sin(x), x);
  int(sin(x), x);
  # Numeric (definite)
  evalf(Int(sin(x), x = 0 .. 10));
  evalf(int(sin(x), x = 0 .. 10));
```

$$\int \sin(x)\, dx$$

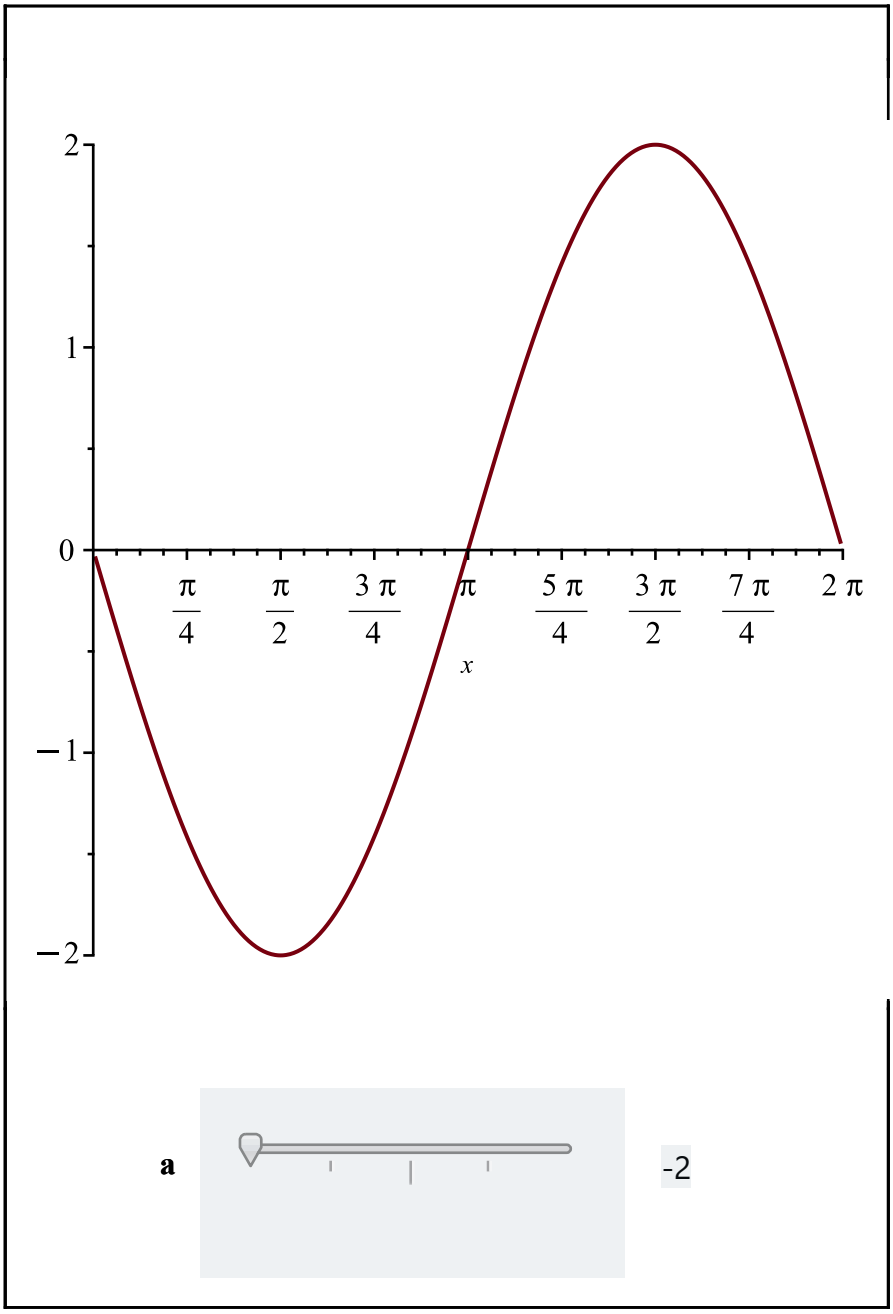
$$-\cos(x)$$

$$1.839071529$$

$$1.839071529 \qquad \textbf{(2.1)}$$

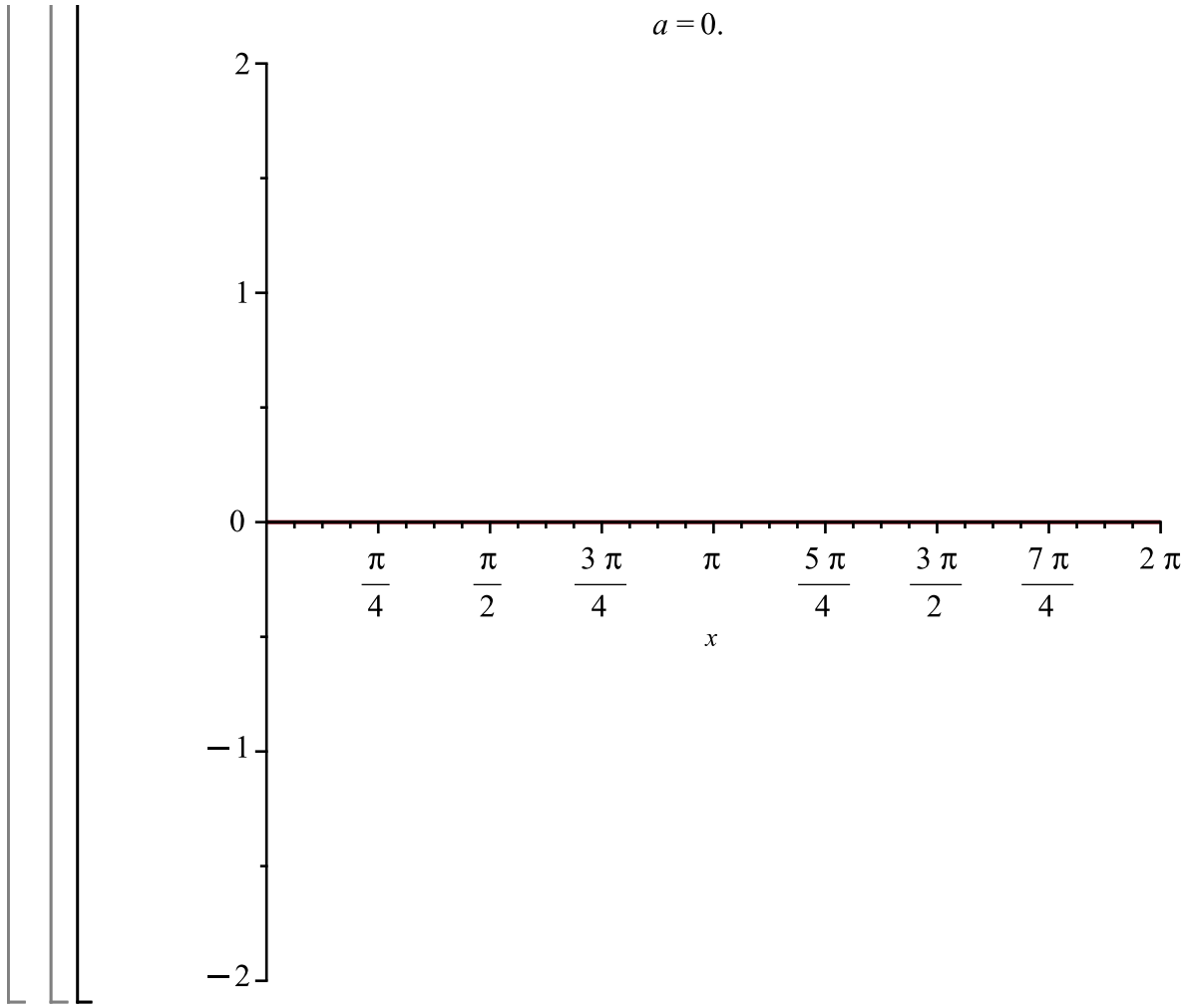
Creating Interactive Math with Explore

```
> Explore(
    plot(a * sin(x), x = 0 .. 2 * Pi),
    parameters = [a = -2 .. 2]
  );
```



Custom Animation

```
> plots[animate](plot, [a*sin(x), x=0..2*Pi], a=0..2);
```



Exporting Data to CSV

```
> data := [[1, 2], [3, 4], [5, 6]];
  Export("output.csv", data);
   #if permission denied, then first need to change the directory
```

$$data := [[1, 2], [3, 4], [5, 6]]$$

```
Error, (in Export) permission denied
```

Creating and Using a Maple Module

```
> MyUtils := module( )
     export square, cube;
     square := proc(x) return x^2; end proc;
     cube := proc(x) return x^3; end proc;
  end module:

  MyUtils:-square(4);
   MyUtils:-cube(3);
```

$$16$$

$$27 \qquad (5.1)$$

```
>
```