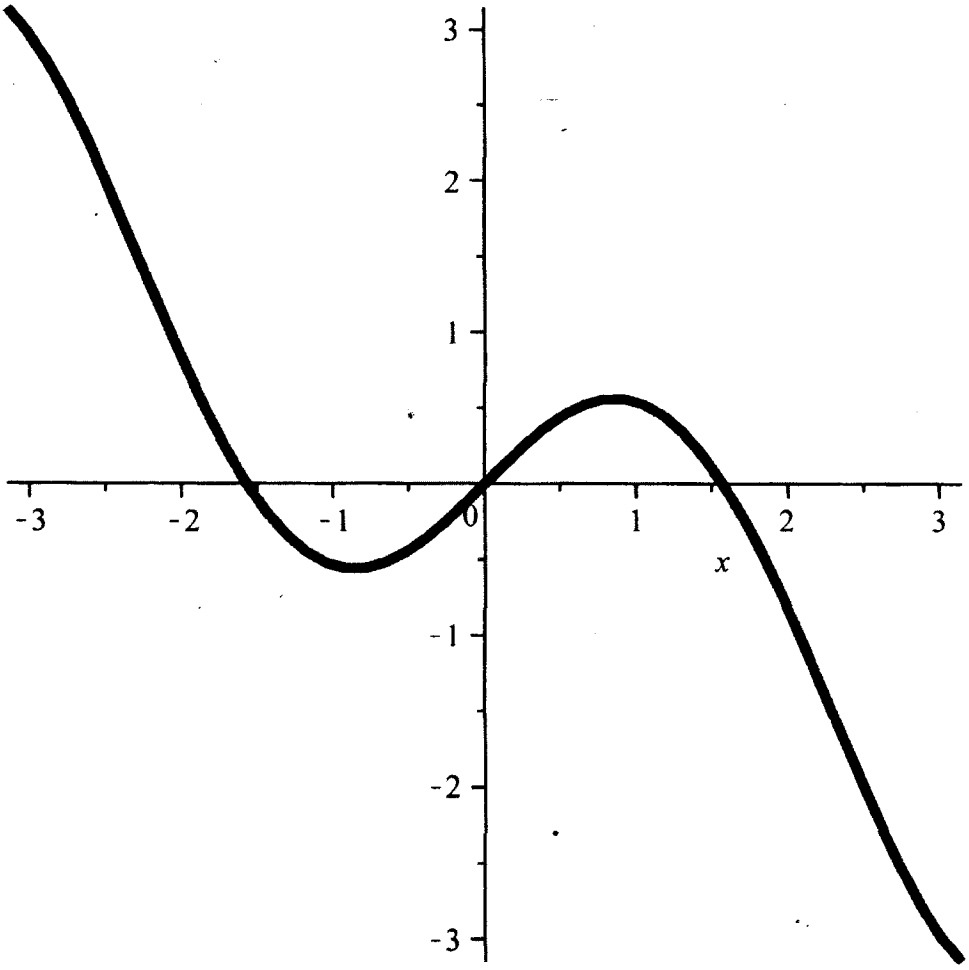
Example $f(x) = x\cos x$, $x \in [-\pi, \pi]$

graph $y = f(x)$

```
> restart : with(plots) : with(plottools) :
> a := x·cos(x) :
> b := plot(a, x = -Pi..Pi, color = blue, thickness = 4) :
> display(b);
```



find f'

```
> d := diff(a, x);
```

$$d := \cos(x) - x\sin(x) \quad (1)$$

solve $f'(x) = 0$

```
> eqn := d = 0;
```

$$eqn := \cos(x) - x\sin(x) = 0 \quad (2)$$

```
> soln1 := fsolve(eqn, x, -2..0) :
> soln2 := fsolve(eqn, x, 0..2) :
> soln1, soln2;
```

$$-0.8603335890,\ 0.8603335890 \quad (3)$$

evaluate f at the critical points

```
> eval(a, x = soln1);
```

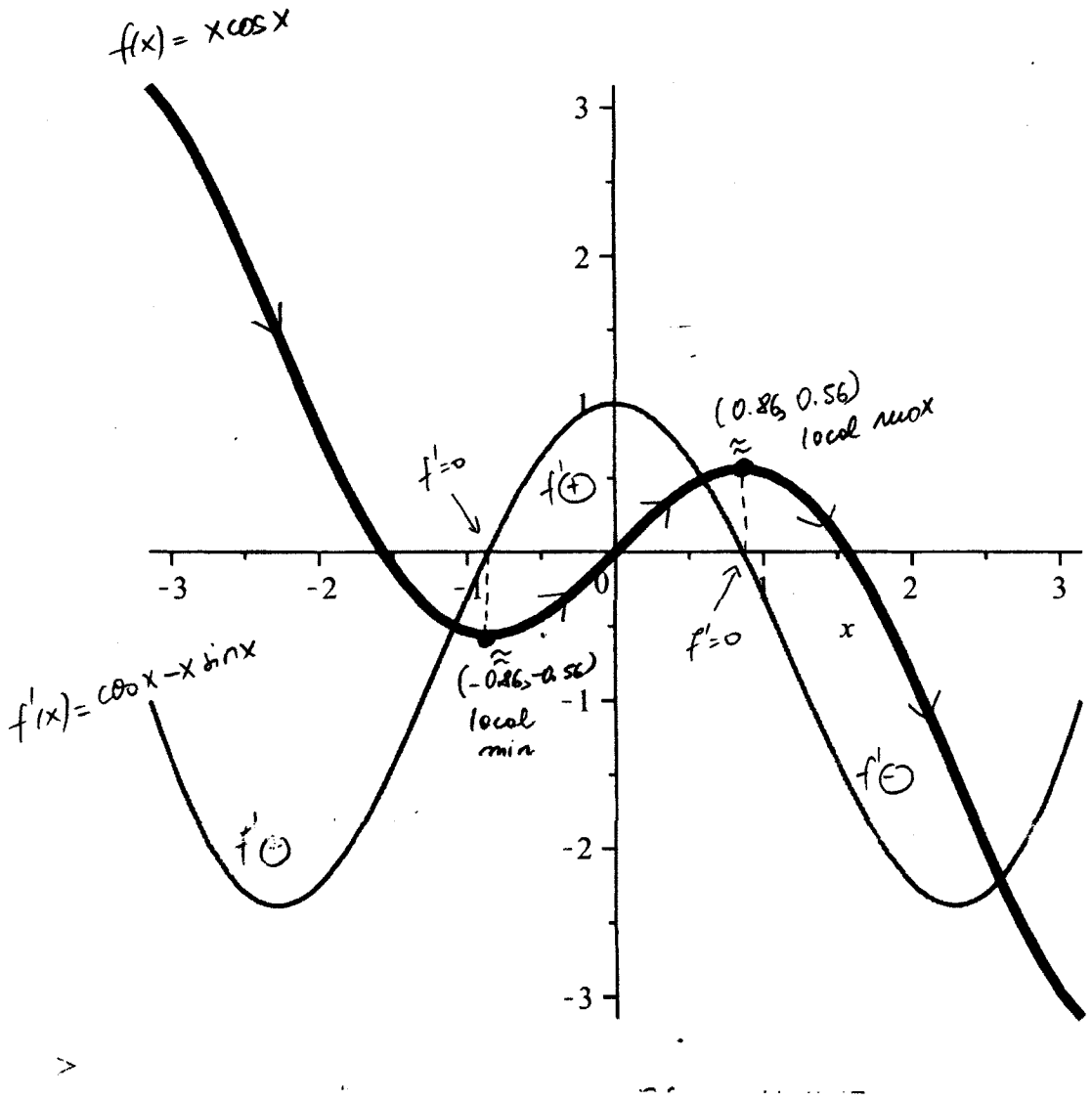
$$-0.5610963382 \quad (4)$$

```
> eval(a, x = soln2);
```

$$0.5610963382 \quad (5)$$

graph f, f'

```
> g := plot(d, x = -Pi..Pi, color = red, thickness = 2) :
> display(b, g);
```



Answers:

b) Domain: $x \in \mathbb{R}$

c) Critical numbers: $x \approx -0.86$ and $x \approx 0.86$

d) - local minimum value is $f(-0.86) = -0.56$;
- local maximum value is $f(0.86) = 0.56$;
- the function is decreasing on $[-\pi, -0.86] \cup [0.86, \pi]$ and increasing on $[-0.86, 0.86]$