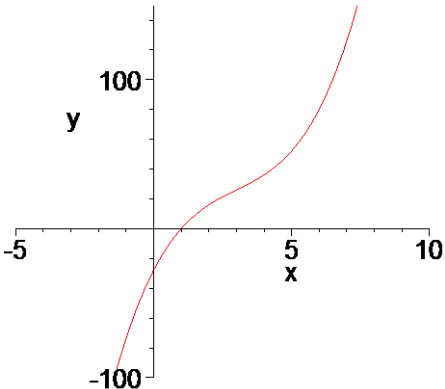


Diskriminant polynomu

ÚKOL: U daných polynomů určete hodnotu jejich diskriminantu (příkaz **discrim**), určete reálné kořeny (příkaz **roots**) a proveďte rozklad v $\mathbb{R}[x]$ ($\mathbb{C}[x]$).

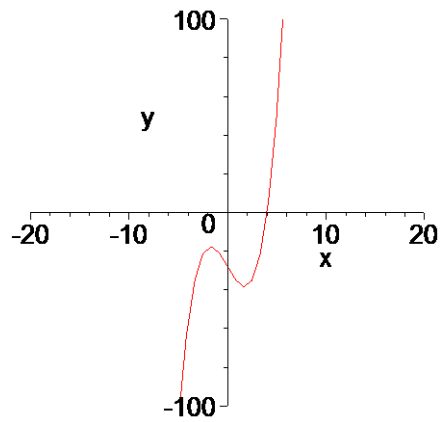
a) $x^3 - 9x^2 + 36x - 28$

```
[ > restart;
[ > p1:=x^3-9*x^2+36*x-28;
                                p1 := x3 - 9x2 + 36x - 28
[ > discrim(p1,x);
                                -21168
[ > roots(p1);
                                [[1, 1]]
[ > factor(p1);
                                (x - 1)(x2 - 8x + 28)
[ > plot(p1,x=-5..10,y=-100..150,tickmarks=[3,3]);
```



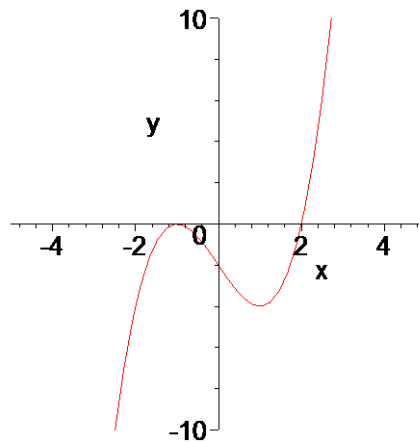
b) $x^3 - 9x - 28$

```
[ > restart;
[ > p2:=x^3-9*x-28;
                                p2 := x3 - 9x - 28
[ > discrim(p2,x);
                                -18252
[ > roots(p2);
                                [[4, 1]]
[ > factor(p2);
                                (x - 4)(x2 + 4x + 7)
[ > plot(p2,x=-20..20,y=-100..100,tickmarks=[3,3]);
```



c) $x^3 - 3x - 2$

```
[ > restart;
  > p3:=x^3-3*x-2;
                                     p3 := x3 - 3x - 2
  > discrim(p3,x);
                                     0
  > roots(p3);
                                     [[2, 1], [-1, 2]]
  > factor(p3);
                                     (x - 2)(x + 1)2
  > plot(p3,x=-5..5,y=-10..10,tickmarks=[3,3]);
```



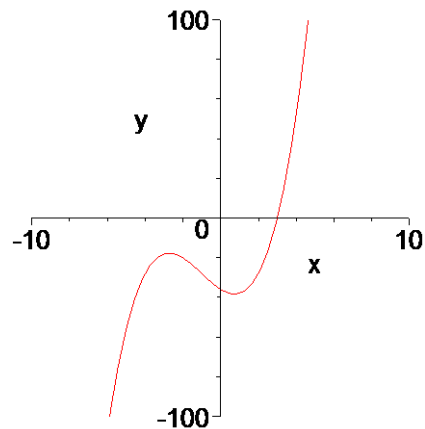
d) $x^3 + 3x^2 - 6x - 36$

```
[ > restart;
  > p4:=x^3+3*x^2-6*x-36;
                                     p4 := x3 + 3x2 - 6x - 36
  > discrim(p4,x);
                                     -18252
  > roots(p4);
                                     [[3, 1]]
```

```
> factor(p4);
```

$$(x-3)(x^2+6x+12)$$

```
> plot(p4,x=-10..10,y=-100..100,tickmarks=[3,3]);
```



e) $x^3 - 7x - 6$

```
> restart;
```

```
> p5:=x^3-7*x-6;
```

$$p5 := x^3 - 7x - 6$$

```
> discrim(p5,x);
```

400

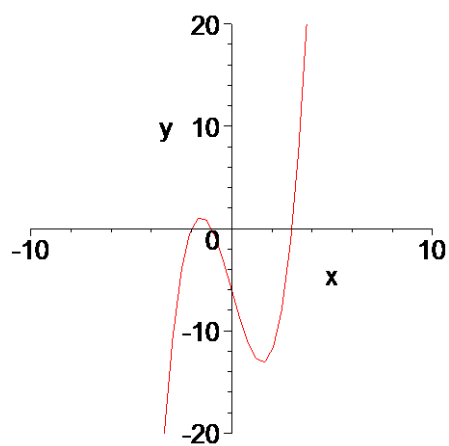
```
> roots(p5);
```

[[3, 1], [-2, 1], [-1, 1]]

```
> factor(p5);
```

$$(x-3)(x+2)(x+1)$$

```
> plot(p5,x=-10..10,y=-20..20,tickmarks=[3,3]);
```



f) $x^4 + 2x^3 - 6x^2 - 5x + 2$

```
> restart;
```

```
> p6:=x^4+2*x^3-6*x^2-5*x+2;
```

$$p6 := x^4 + 2x^3 - 6x^2 - 5x + 2$$

```
> discrim(p6,x);
```

85293

```
> roots(p6);
```

```
[[2, 1], [-1, 1]]
```

```
> factor(p6);
```

```
(x - 2)(x + 1)(x2 + 3x - 1)
```

```
> Rozklad_R:=polytools[split](p6,x);
```

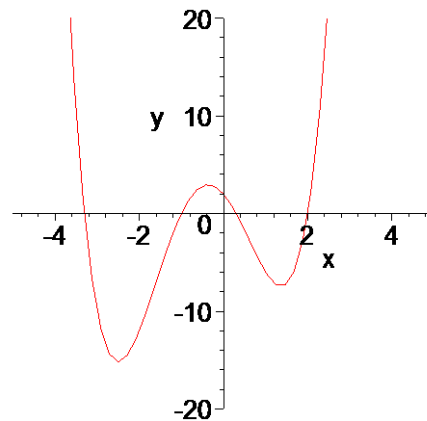
```
Rozklad_R :=
```

```
(x - RootOf(_Z2 + 3_Z - 1))(x + 1)(3 + RootOf(_Z2 + 3_Z - 1) + x)(x - 2)
```

```
> convert(Rozklad_R,radical);
```

```
 $\left(x + \frac{3}{2} - \frac{\sqrt{13}}{2}\right)(x + 1)\left(\frac{3}{2} + \frac{\sqrt{13}}{2} + x\right)(x - 2)$ 
```

```
> plot(p6,x=-5..5,y=-20..20,tickmarks=[3,3]);
```



g) $x^4 + 2x^3 + 4x^2 - 7$

```
> restart;
```

```
> p7:=x^4+2*x^3+4*x^2-7;
```

```
p7 := x4 + 2x3 + 4x2 - 7
```

```
> discrim(p7,x);
```

```
-117936
```

```
> roots(p7);
```

```
[[1, 1]]
```

```
> factor(p7);
```

```
(x - 1)(x3 + 3x2 + 7x + 7)
```

```
> Rozklad_R:=polytools[split](p7,x):
```

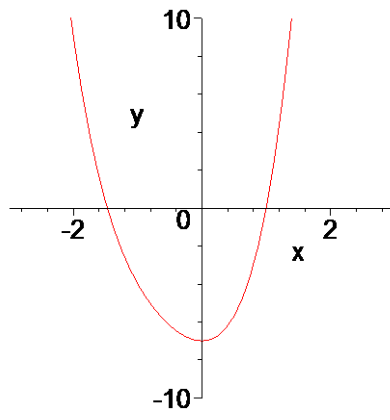
```
> convert(Rozklad_R,radical):
```

```
> evalf(%);
```

```
(x - 1.) (x + 1.473465808 - 0.1 10-8 I) (x + 0.7632670960 - 2.041599227 I)
```

```
(x + 0.7632670961 + 2.041599228 I)
```

```
> plot(p7,x=-3..3,y=-10..10,tickmarks=[3,3]);
```



- [>
- [>