HW_11

September 24, 2022

[47]:
```
import sympy
from sympy.plotting import plot
```

[48]:
```
x = Symbol('X')
```

[49]:
```
a =18
b =5
c =10
d =-30
f = a*x**3+b*x**2+c*x+d
f
```

[49]: $18X^3 + 5X^2 + 10X - 30$

1

[50]:
```
solveset(f, x, S.Reals)
```

[50]: $\left\{-\frac{515}{2916\sqrt[3]{\frac{135145}{157464} + \frac{5\sqrt{252411}}{2916}}} - \frac{5}{54} + \sqrt[3]{\frac{135145}{157464} + \frac{5\sqrt{252411}}{2916}}\right\}$

0.96

2

2.1

[51]:
```
d= Derivative(f)
df=d.doit()
df
```

[51]: $54X^2 + 10X + 10$

[52]:
```
print(discriminant(df))
```

-2060

=> => => .

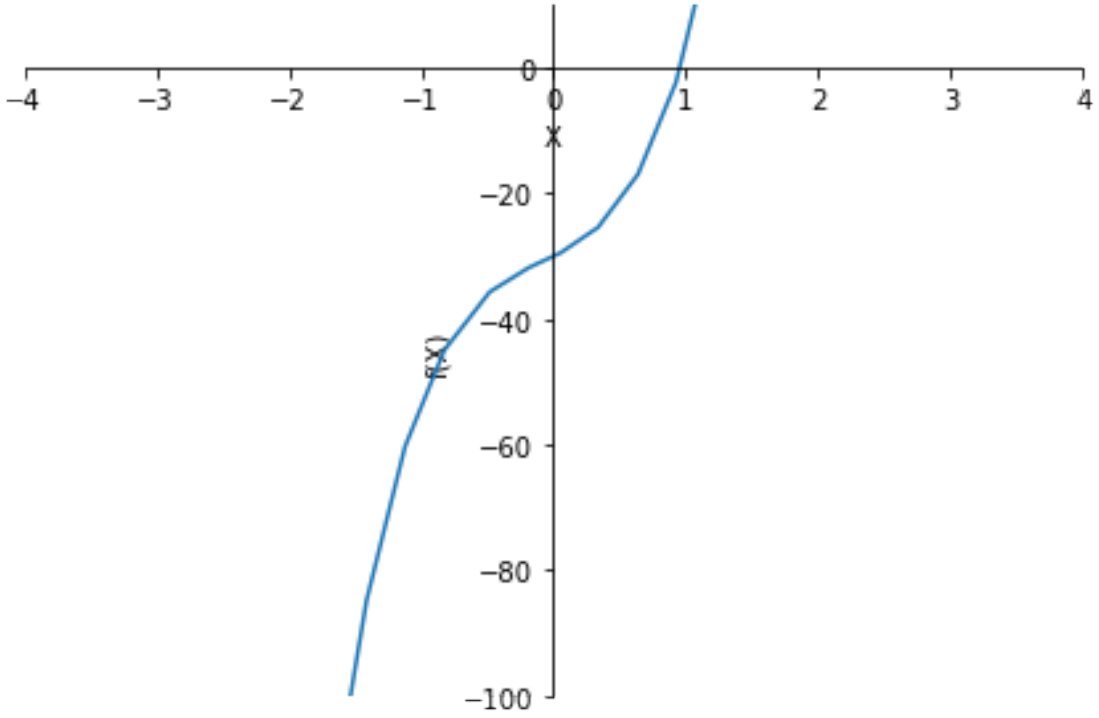
[53]:
```
Solve = solveset(df > 0, x , S.Reals )
Solve
```

[53]:
$(-\infty, \infty)$

, , , .

3

[54]:
```
plot(f, xlim=[-4,4], ylim=[-100,10])
f
```



[54]:
$18X^3 + 5X^2 + 10X - 30$

4 f > 0 f < 0

, ,

[55]:
```
positive = solveset(f > 0, x , S.Reals )
positive
```

[55]:
$$\left(-\frac{515}{2916\sqrt[3]{\frac{135145}{157464}+\frac{5\sqrt{252411}}{2916}}}-\frac{5}{54}+\sqrt[3]{\frac{135145}{157464}+\frac{5\sqrt{252411}}{2916}},\infty\right)$$

[56]:
```
negative = solveset(f < 0, x , S.Reals )
negative
```

[56]:
$$\left(-\infty, -\frac{515}{2916\sqrt[3]{\frac{135145}{157464}+\frac{5\sqrt{252411}}{2916}}} - \frac{5}{54} + \sqrt[3]{\frac{135145}{157464}+\frac{5\sqrt{252411}}{2916}}\right)$$