Problemas de límites con Python

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1. Calcula el límite siguiente en python:

$$\lim_{x\to 0}\frac{\sqrt{1+2x}-\sqrt{1+3x}}{x+2x^2}$$

```
import sympy as sp

x = sp.Symbol("x")

sp.limit((sp.sqrt(1+2*x)-sp.sqrt(1+3*x))/(x+2*x**2),x,0)
```

```
## -1/2
```

2. Demuestra usando python que no existe el $\lim_{x\to 0}\cos\frac{1}{x}$ y que $\lim_{x\to 0} x\cos\frac{1}{x}=0$

```
import sympy as sp
x = sp.Symbol("x")

sp.limit(sp.cos(1/x),x,0)
```

```
## AccumBounds(-1, 1)
```

```
sp.limit(x*sp.cos(1/x),x,0)
```

```
## 0
```

3. Calcula los límites siguientes usando python:

a) $\lim_{x\to 1}\frac{\sqrt{x}-1}{x-1}$

```
sp.limit((sp.sqrt(x)-1)/(x-1),x,1)
```

```
## 1/2
```

b) $\lim_{x\to a}\frac{x^2-(a+1)x+a}{x^3-a^3}$, para a=2

```
a=2
sp.limit((x**2-(a+1)*x+a)/(x**3-a**3),x,a)
```

```
## 1/12
```

c) $\lim_{x\to 0}(\frac{1-x}{1+x})^{\frac{1}{x}}$

```
sp.limit(((1-x)/(1+x))**(1/x),x,0)
```

```
## exp(-2)
```

d) $\lim_{x\to 0}\frac{1}{x}\log\sqrt{\frac{1+x}{1-x}}$

```
sp.limit((1/x)*sp.log(sp.sqrt((1+x)/(1-x))),x,0)
```

```
## 1
```

4. Calcula los límites siguientes usando python:

a) $\lim_{x\to 0}\frac{\sin 2x}{3x-5x^3}$

```
sp.limit(sp.sin(2*x)/(3*x-5*x**3),x,0)
```

```
## 2/3
```

b) $\lim_{x\to 0}\frac{\sqrt[3]{x^3+2x^4}}{\log(1+2x)}$

```
sp.limit((x**3+2*x**4)**(1/3)/sp.log(1+2*x),x,0)
```

```
## 1/2
```

c) $\lim_{x\to 0}\frac{(x+1)^n-1}{nx}$

```
import sympy as sp

x = sp.Symbol("x")
n = sp.Symbol("n")

sp.limit(((x+1)**n - 1)/(n*x),x,0)
```

```
## 1
```

d) $\lim_{x\to 0}\frac{\sqrt[n]{x+1}-1}{x}$

```
import sympy as sp

x = sp.Symbol("x")
n = sp.Symbol("n")

sp.limit(((x+1)**(1/n)-1)/(x),x,0)
```

```
## 1/n
```

e) $\lim_{x\to 1} \frac{\tan(x^2-1)}{x-1}$

```
sp.limit((sp.tan(x**2-1))/(x-1),x,1)
```

```
## 2
```

f) $\lim_{x\to 0} \frac{a^x-1}{x\log a}$

```
import sympy as sp

x = sp.Symbol("x")
a = sp.Symbol("a")

sp.limit((a**x-1)/(x*sp.log(a)),x,0)
```

```
## 1
```