In [ ]:
```python
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#1BM21AI008


import numpy as np
import matplotlib.pyplot as plt
def f(x):
    return 1/x
def g(x):
    return x**2
def h(x):
    return x**3
def f_dash(x,f):
    epsilon = np.finfo(np.float32).eps
    slope = (f(x+epsilon)-f(x))/epsilon
    y = f(x)
    c = y - slope*x
    return slope, c
def fig_plot(y,y2,sl1,sl2,function,derivative,f):
    a = np.arange(-0.01, 0, 0.0001)
    b = np.arange(0.0001, 0.01, 0.0001)
    tanent_1 = []
    tanent_2 = []
    p1 = -0.005
    p2 = 0.005
    s1,c1 = f_dash(p1,f)
    s2,c2 = f_dash(p2,f)
    c = np.concatenate((a,b),axis = 0)
    for x in c:
        tanent_1.append(s1*x+c1)
        tanent_2.append(s2*x+c2)
    plt.figure(figsize=(10, 4))
    plt.subplot(1,2,1)
    plt.title("f(x) = {}\ntangents at point -0.005 and 0.005".format(function))
    plt.plot(a,y,color= "blue")
    plt.plot(b,y2, color = "blue")
    plt.plot(c,tanent_1)
    plt.plot(c,tanent_2)
    plt.subplot(1,2,2)
    plt.plot(a,sl1,color= "blue")
    plt.plot(b,sl2,color = "blue")
    plt.title("f'(x) = {}".format(derivative))
def ffill(func):
    y = []
    y2 = []
    sl1 = []
    sl2 = []
    a = np.arange(-0.01, 0, 0.0001)
    b = np.arange(0.0001, 0.01, 0.0001)
    for x in a:
        y.append(func(x))
        slope, c = f_dash(x,func)
        sl1.append(slope)
    for x in b:
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            y2.append(func(x))
            slope, c = f_dash(x,func)
            sl2.append(slope)
        return y,y2,sl1,sl2
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In [ ]:  X = []
         Y = []
         for x in [1, -1]:
             slope, c = f_dash(x,f)
             print("slope at x={} is {}".format(x, slope))
             print("Tangent line is y={:f}x{:+f}".format(slope, c))
```
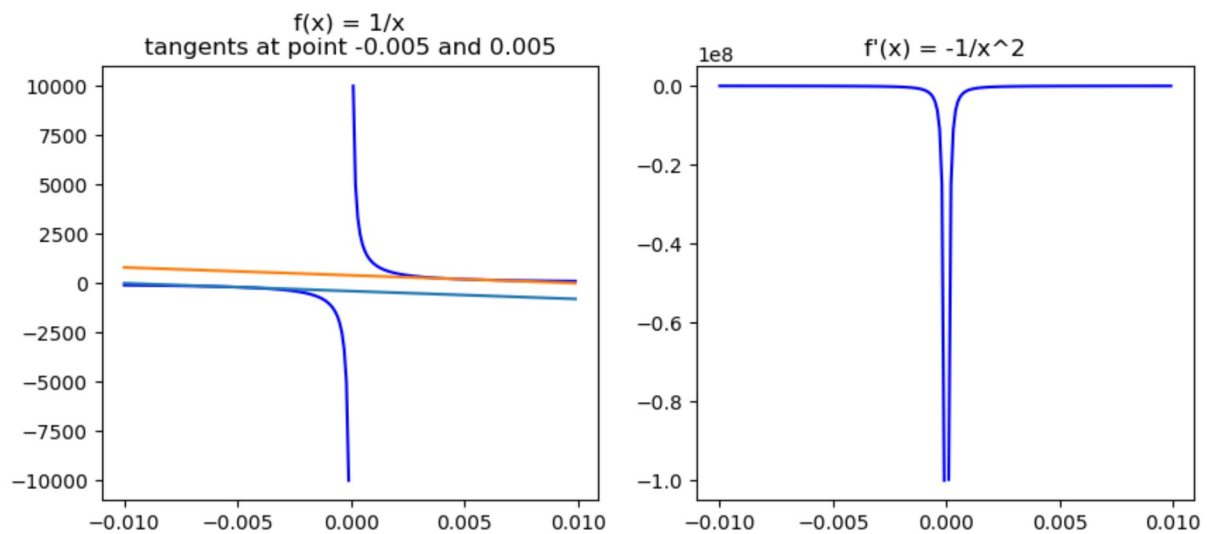
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slope at x=1 is -0.9999998807907104
Tangent line is y=-1.000000x+2.000000
slope at x=-1 is -1.0000001192092896
Tangent line is y=-1.000000x-2.000000
```

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In [ ]:  y,y2,sl1,sl2 = ffill(f)
         fig_plot(y,y2,sl1,sl2,"1/x","-1/x^2",f)
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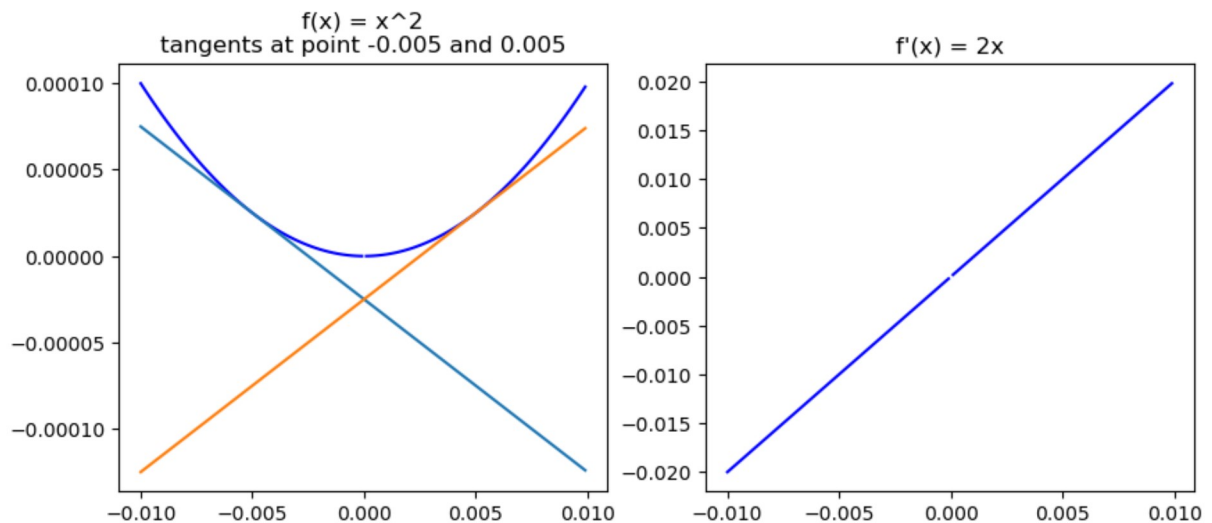


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In [ ]:  y,y2,sl1,sl2 = ffill(g)
         fig_plot(y,y2,sl1,sl2,"x^2","2x",g)
```

In [ ]:
```python
y,y2,sl1,sl2 = ffill(h)
fig_plot(y,y2,sl1,sl2,"x^3","3x^2",h)
```