201600282 엄기산

In [14]:
```
from IPython.core.interactiveshell import InteractiveShell
InteractiveShell.ast_node_interactivity = "all"

from collections import Counter
#from linear_algebra import distance, vector_subtract, scalar_multiply

#original version
def squared_distance(v, w):
    return sum_of_squares(vector_subtract(v, w))

def distance(v, w):
    return math.sqrt(squared_distance(v, w))

def vector_subtract(v, w):
    """subtracts two vectors componentwise"""
    return [v_i - w_i for v_i, w_i in zip(v,w)]

def scalar_multiply(c, v):
    return [c * v_i for v_i in v]

def vector_add(v, w):
    """adds two vectors componentwise"""
    return [v_i + w_i for v_i, w_i in zip(v,w)]

def vector_sum(vectors):
    return reduce(vector_add, vectors)

def vector_mean(vectors):
    """compute the vector whose i-th element is the mean of the
    i-th elements of the input vectors"""
    n = len(vectors)
    return scalar_multiply(1/n, vector_sum(vectors))

def difference_quotient(f, x, h):
    return (f(x + h) - f(x)) / h

def square(x: float) -> float:
    return x * x

def derivative(x: float) -> float:
    return 2 * x
```

In [15]:
```
from functools import reduce
import math, random

import numpy as np
import matplotlib.pyplot as plt

%matplotlib inline

def sum_of_squares(v):
    """computes the sum of squared elements in v"""
    return sum(v_i ** 2 for v_i in v)

vector = [i for i in range(10)]
sum_of_squares(vector)

np.sum(np.square(vector))
```

Out[15]:

Out[15]: 285

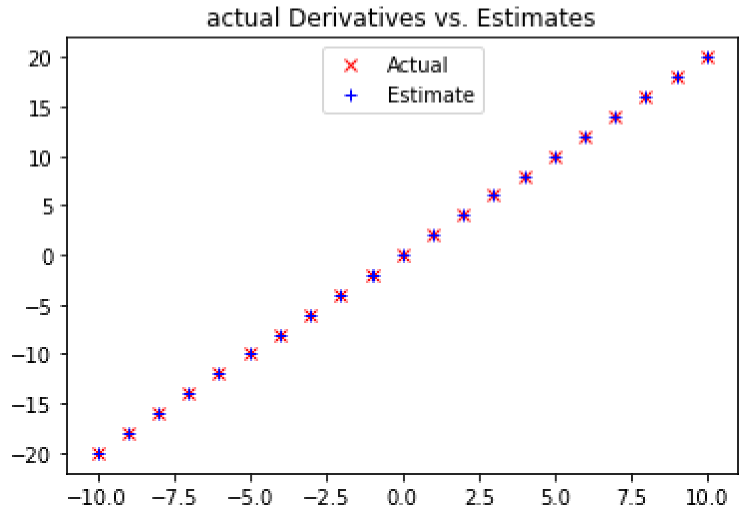
In [16]:
```python
def difference_quotient(f, x, h):
    return (f(x + h) - f(x)) / h

def square(x: float) -> float:
    return x * x

def derivative(x: float) -> float:
    return 2 * x

xs = range(-10,11)
actuals = [derivative(x) for x in xs]
estimates = [difference_quotient(square, x, h=0.0001) for x in xs]

# 두 계산식의 결괏값이 거의 비슷함을 보여 주기 위한 그래프
# plot to show they're basically the same

import matplotlib.pyplot as plt
plt.title("actual Derivatives vs. Estimates")
plt.plot(xs, actuals, 'rx', label='Actual')          # red  x
plt.plot(xs, estimates, 'b+', label='Estimate')      # blue +
plt.legend(loc=9)
plt.show()                                            # purple *, hopefully
```

Out[16]: Text(0.5, 1.0, 'actual Derivatives vs. Estimates')

Out[16]: [<matplotlib.lines.Line2D at 0x1490093d0a0>]

Out[16]: [<matplotlib.lines.Line2D at 0x1490093d400>]

Out[16]: <matplotlib.legend.Legend at 0x1497d45a8e0>



In [ ]:

In [17]:
```python
# Using gradient descent to fit models

def gradient_step(v, gradient, step_size):
    """Moves `step_size` in the `gradient` direction from `v`"""
    assert len(v) == len(gradient)
    step = scalar_multiply(step_size, gradient)
    return vector_add(v, step)

# x ranges from -50 to 49, y is always 20 * x + 5
inputs = [(x, 20 * x + 5) for x in range(-50, 50)]
```

```python
print(inputs)

#def linear_gradient(x: float, y: float, theta: Vector) -> Vector:
def linear_gradient(x, y, theta):
    slope, intercept = theta
    predicted = slope * x + intercept
    error = (predicted - y)
    squared_error = error ** 2
    grad = [2 * error * x, 2 * error]
    return grad
```

```
[(-50, -995), (-49, -975), (-48, -955), (-47, -935), (-46, -915), (-45, -895), (-44, -875), (-43, -855), (-42, -835), (-41, -815), (-40, -795), (-39, -775), (-38, -755), (-37, -735), (-36, -715), (-35, -695), (-34, -675), (-33, -655), (-32, -635), (-31, -615), (-30, -595), (-29, -575), (-28, -555), (-27, -535), (-26, -515), (-25, -495), (-24, -475), (-23, -455), (-22, -435), (-21, -415), (-20, -395), (-19, -375), (-18, -355), (-17, -335), (-16, -315), (-15, -295), (-14, -275), (-13, -255), (-12, -235), (-11, -215), (-10, -195), (-9, -175), (-8, -155), (-7, -135), (-6, -115), (-5, -95), (-4, -75), (-3, -55), (-2, -35), (-1, -15), (0, 5), (1, 25), (2, 45), (3, 65), (4, 85), (5, 105), (6, 125), (7, 145), (8, 165), (9, 185), (10, 205), (11, 225), (12, 245), (13, 265), (14, 285), (15, 305), (16, 325), (17, 345), (18, 365), (19, 385), (20, 405), (21, 425), (22, 445), (23, 465), (24, 485), (25, 505), (26, 525), (27, 545), (28, 565), (29, 585), (30, 605), (31, 625), (32, 645), (33, 665), (34, 685), (35, 705), (36, 725), (37, 745), (38, 765), (39, 785), (40, 805), (41, 825), (42, 845), (43, 865), (44, 885), (45, 905), (46, 925), (47, 945), (48, 965), (49, 985)]
```

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