03-24-26 MTH 261

Section 2.10: Other Applications
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Exam 2		stem & leaf		
55.71429	mean			A- 0
21.01072	st.dev			B - 2
62	median	8	12	C - 2
21	min	7	27	D - 4
82	max	6	2248	F - 6
14	count	5	2	
		4	08	
		3	0	
		2	11	

Exam 1		stem & leaf		
52.46667	mean			A- 1
20.6012	st.dev	9	2	B - 0
56	median	8		C - 0
19	min	7		D - 6
92	max	6	035688	F - 8
15	count	5	66	
		4	445	
		3		
		2	01	
		1	9	

12 class meetings before final exam
8 textbook sections
1 textbook section per class meeting

2.10

$$f'(a) \cong \frac{\Delta y}{\Delta x} = \frac{f(x) - f(a)}{x - a}$$

$$(f'(a))(x-a) \approx f(x) - f(a)$$

$$f(x) \approx f(a) + (f'(a))(x-a)$$

supplied

The Tangent Line Approximation (TLA)
To approximate the value of $f(x)$ using TLA, find some a where
1. a and x are "close," and

2. You know the exact values of both $f(a)$ and $f'(a)$.

Then $f(x) \cong f(a) + f'(a)(x-a)$

Another way to look at the same formula:

$$\Delta y \cong f'(a)\Delta x$$

How close is close? It depends on the shape of the graph of f. In general, the closer the better.

Let $\Delta x = x - a$

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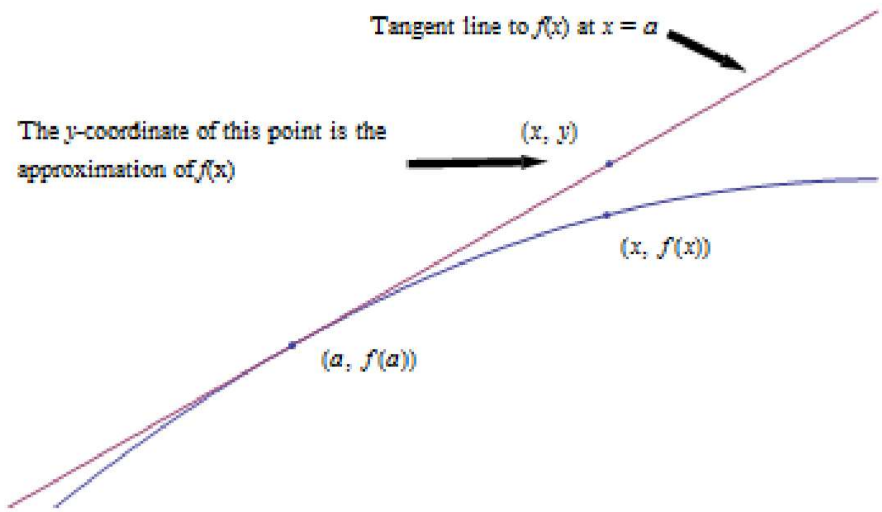
$$\underbrace{f(x) - f(a)}_{\Delta y} \approx \left(f'(a)\right)\underbrace{(x-a)}_{\Delta x}$$



Supplied

Elasticity of Demand
Given a demand function that gives q in terms of p,

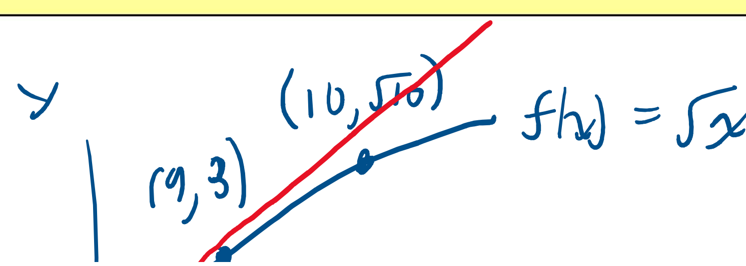
The elasticity of demand is $E = \left| \frac{p}{q} \cdot \frac{dq}{dp} \right|$

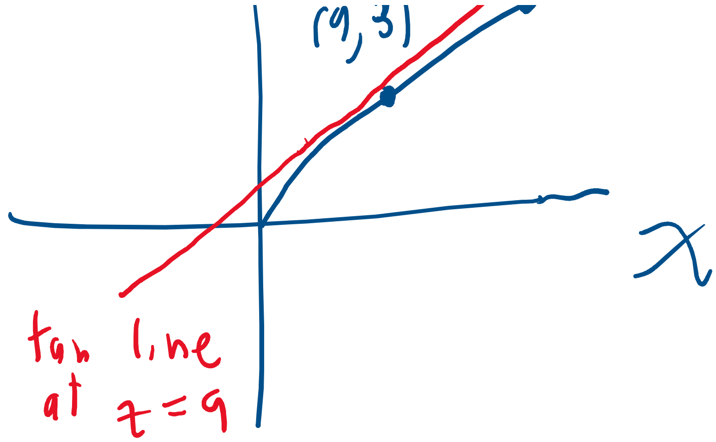
(Note that since demand is a decreasing function of p, the derivative is negative. That's why we have the absolute values – so E will always be positive.)

If **E < 1,** we say demand is **inelastic.** In this case, raising prices increases revenue.
If **E > 1**, we say demand is **elastic.** In this case, raising prices decreases revenue.
If **E = 1**, we say demand is **unitary**. E = 1 at critical points of the revenue function.

Interpretation of elasticity:
If the price increases by 1%, the demand will decrease by **E**%.

Use TLA to estimate $\sqrt{10}$





$$f(10) \approx f(9) + (f'(9))(10-9)$$

$$= \sqrt{9} + (f'(9))(1)$$

$$= 3 + f'(9)$$

$$f(x) = \sqrt{x} = x^{\frac{1}{2}}$$

$$f'(x) = \left(\tfrac{1}{2}\right) x^{-\frac{1}{2}}$$

$$f'(9) = \frac{1}{2\sqrt{9}} = \frac{1}{(2)(3)} = \frac{1}{6}$$

$$\sqrt{10} \approx 3\tfrac{1}{6} = \frac{19}{6}$$

19/6=3.1667 $\approx$ 3.17

Sqrt(10)=3.16227766016838 $\approx$ 3.16

0.01 error