18.01, September 23, 2003 Linear Approx.

2 A-1, 2 A-4, 2 A-9, 2 A-11, 2 A-12

1. Did this very quickly, but didn't get through all I prepared. Some students don't understand why lin. Approx. (and quadratic aprox.) is useful!!!

2. Defrn of linear approx. of f(x) near a $f(x) \approx f(\alpha) + f'(\alpha) \bullet (x - \alpha)$

3. Basic approximation

$$\frac{1}{1-x} \approx 1 + x + x^2 + \ldots$$

$$(1+x)^r \approx 1 + rx + \frac{r(r-1)}{2} x^2 + \ldots$$

$$\sin(x) \approx x + \ldots, \cos(x) \approx 1 - \frac{x^2}{2} + \ldots$$

$$e^x \approx (1 + \frac{x}{n})^n \approx 1 + x + \frac{x^2}{2} + \ldots, \log(1-x) \approx x + \frac{x^2}{2} + \ldots$$

4. Computed linear approximation of $e^{-3x}\sin(2\pi x) + 5e^{-3x}\cos(2\pi x), n \in r, x = 0$ using basic approx. (instead of differentiation).

5. Manipulating linear approx. (a) scaling x, (b) ftg, cof, fog, and f/g ← hard one given approx. of f(x) and g(x).

6. Defined quadratic approx.

$f(x) \approx f(\alpha) + f'(\alpha)(x-\alpha) + \frac{1}{2} f''(\alpha)(x-a)^2$ and explain factor of $\frac{1}{2}$

7. How to go from $x = a$ to $x = 0; x = a + h$