Closing Today: 3.6-9
Closing Fri: 3.9
Note: 3.10 due next Friday
Office Hours Today: 1:15-3:15pm (Tho 335)
Math Study Center: 9:30am – 9:30pm (Com B-014)
CLUE Tutors: 7:00pm – midnight (Mary Gates Hall)

Exam 2 is Tuesday! Covers 3.1-3.6, 3.9
All derivative rules: Product, Quotient, Chain, Implicit, Log, Parametric
Applications: Related Rates, Tangents
Expect a problem of each type.
Important Note: There is a holiday on Monday, we will review on Friday.

Entry Task: (from handout) A kite in the air at an altitude of 400 ft is being blown horizontally at the rate 10 ft/sec away from the person holding the kite string at ground level. At what rate is the string being let out when 500 feet of string is already out?

One bicycle is 4 miles east of an intersection, travelling toward the intersection at the rate of 9 mi/hr. At the same time a second bike is 3 miles south of the intersection and is travelling away from the intersection at a rate of 10 mi/hr. At what rate is the distance between them changing? Is this distance increasing or decreasing?

A 13-ft ladder is leaning against a wall and its base is slipping away from the wall at a rate of 3 ft/sec when it is 5 ft from the wall. How fast is the top of the ladder dropping at that moment?

A particle moves on the graph of $y = x^3 + x^2 + 1$, the *x*-coordinate changing at a constant rate of 2 units/sec.

How fast is the *y*-coordinate changing when the particle is at the point (1,3)?

A video camera is fixed to the origin and pointing at the moving particle. How fast is the angle of inclination, θ, of the camera changing when x = 1?

Homework:

A lighthouse is located on a small island 2 km away from the nearest point P on a straight shoreline and its light makes three revolutions per minute. How fast is the beam of light moving along the shoreline when it is 1 km from P? (Round your answer to one decimal place.)

3.10 Linear Approximation

Idea: "Near" the point (a,f(a)) the graphs of $y = f(x)$ and the tangent line

$$y = f'(a)(x - a) + f(a)$$

are very close together.

We say the tangent line is a **linear approximation** or **linearization** or **tangent line approximation** to the function. Sometimes it is written as

$$L(x) = f'(a)(x - a) + f(a)$$

In other words:

If $x \approx a$, then

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

Examples:

1. Find the linear approximation of $f(x) = \sqrt{x}$ at $x = 81$. Then use it to approximate the value of $\sqrt{82}$.

2. Find the linearization of $g(x) = \sin(x)$ at $x = 0$. Then use it to approximate the value of sin(0.03).

3. Using tangent line approximation estimate the value of $\sqrt[3]{8.5}$.