MATH 100 – WORKSHEET 12
RELATED RATES

1. RELATED RATES

(1) Two ships are travelling near an island. The first is located 20km due west of it and is moving due north at 5km/h. The second is located 15km due south of it and is moving due south at 7km/h. How fast is the distance between the ships changing?

(2) The same setting, but now the first ship is moving toward the island.

(3) A conical drain is 6m tall and has radius 1m at the top.
  (a) The drain is clogged, and is filling up with rain water at the rate of $5\text{m}^3/\text{min}$. How fast is the water rising when its height is 5m?
  (b) The drain is unclogged and water begins to clear at the rate of $15\text{m}^3/\text{min}$ (but rain is still falling). At what height is the water falling at the rate of 40m/min?

2. THE LINEAR APPROXIMATION

Fact. *For x near a we have $f(x) \approx L(x)$ where*

$$\boxed{L(x) = f(a) + f'(a)(x - a)}$$

(1) Use a linear approximation to estimate
  (a) $\sqrt{1.2}$

  (b) $(15)^{1/4}$

  (c) $\log 3$