

Math 21A
Vogler
Discussion Sheet 7

1.) The volume V of a sphere is changing at the rate of $\pi \text{ ft.}^3/\text{min}$. At what rate is the sphere's surface area S changing when

a.) $S = 4\pi \text{ ft.}^2$? b.) $S = 36\pi \text{ ft.}^2$?

2.) Car B is 30 miles directly east of car A and begins moving west at 90 mph. At the same moment car A begins moving north at 60 mph.

a.) At what rate is the distance between the cars changing after $t = \frac{1}{5}$ hr. ? $t = \frac{1}{3}$ hr. ?

b.) What is the minimum distance between the cars and at what time t does the minimum distance occur ?

3.) A conical tank (point down) has height 10 ft. and base radius 8 ft. Water begins flowing into the tank at the rate of $\pi \text{ ft.}^3/\text{sec}$. At what rate is the depth h of the water changing

a.) when $h = 1 \text{ ft.}$? b.) when $h = 9 \text{ ft.}$?

4.) Use a differential to estimate the value of each number. Compare your differential estimate with the calculator value of each number.

a.) $\sqrt{27}$ (Use 25 as a convenient, nearby x -value.) b.) $\sqrt{27}$ (Use 36 as a convenient, nearby x -value.)

c.) $12^{1/3}$ d.) $(9900)^{1/4}$.

5.) The radius of a sphere is measured with absolute percentage error of at most 4%. Use differentials to estimate the maximum absolute percentage error in computing the sphere's

a.) surface area. b.) volume.

6.) Use a differential to linearize each function at the given value of x .

a.) $f(x) = \sqrt{x+4}$ at $x = 0$

b.) $f(x) = \sqrt{x+4}$ at $x = 5$

c.) $f(x) = \sqrt{x+4}$ at $x = -3$

d.) $f(x) = x^3 - 2x + \sin x$ at $x = 0$

e.) $f(x) = \frac{4e^x}{e^x + 1}$ at $x = 0$

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The following problem is for recreational purposes only.

11.) Try to figure out what the value of this “continued fraction” is :

$$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \dots}}}}$$