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

    a.) S = $4\pi$ ft.$^2$ ?       b.) S = $36\pi$ 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 $t = \dfrac{1}{5}$ hr. ? $t = \dfrac{1}{3}$ 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 $\pi$ ft.$^3$/sec. At what rate is the depth $h$ of the water changing

    a.) when h = 1 ft. ?       b.) when h = 9 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.) $f(x) = \dfrac{4e^x}{e^x + 1}$ 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 :

$$1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cdots}}}}}$$

Thanks to Dr. Kouba