#s 1, 2: Find the linearization at a.

1. $f(x) = x^4 + 3x^2$ @ $a = 1$

2. $f(x) = \sqrt{x}$ @ $a = 4$

3. Use $g(x) = \sqrt{x+1}$ @ $a = 0$ to approximate $\sqrt{1.1}$ and $\sqrt{.95}$.

#s 4 – 7: Find the differential of each function.

4. $y = x^2 \sin(2x)$

5. $y = \sqrt{1+t^2}$

6. $y = \dfrac{s}{2s+1}$

7. $y = u\cos(u)$

8. For the function $f(x) = -x^2 + 2x$, compute Δy and dy for $x = 2$ and $\Delta x = -.4$. Then draw a picture illustrating the lengths of the line segments $dy, \Delta y,$ and Δx.

#s 9, 10: Use a linear approximation (or "the linearization") to estimate the following.

9. $(1.999)^4$

10. $\dfrac{1}{4.002}$

11. The measured edge of a cube is 30 cm, with an error of $\pm .1$ cm. Use differentials to estimate the maximum error, relative error and percentage error in the resulting calculations of …

    a. … volume; and,

    b. surface area.

12. Use differentials to estimate the amount of paint needed to apply a coat of paint that is .05 cm thick to a hemispherical dome of diameter 50 m.

13. Consider a thin, cylindrical shell of inner radius *r*, height *h*, and thickness Δr.

    a. Estimate the volume of the shell with a differential.

    b. What's the error in using a differential?