## 20 October 2014 Linear Approximation and Differentials

- (1) Use linear approximation to estimate the given number.
  - (a)  $\tan^{-1}(0.1)$

(b)  $\ln 2.6$  (hint:  $e \approx 2.7$ )

(c)  $\sqrt{122}$ 

(2) Find an approximation for 
$$\sqrt{2} \sin\left(\frac{5\pi}{16}\right)$$
 in terms of  $\pi$ .

(3) Verify that  $\sqrt[4]{1+2x} \approx 1 + \frac{1}{2}x$  when x is near 0.

(4) Use differentials to estimate the amount of paint needed to apply a coat of paint 0.05 cm thick to a hemispherical dome with diameter 50 m.

(5) Use differentials to find a formula for the approximate volume of a thin cylindrical shell with height h, inner radius r, and thickness dr.