

Support all answers. If no work is shown, no credit will be awarded. You may use a calculator.

1. Use Newton's method TWICE to estimate the SMALLER root of $f(x) = \sqrt{x^2 + 4} + 4 \sin x$.
2. An airline company offers a round-trip group flight from New York to Frankfurt, Germany. If 100 people sign up for the flight, the cost is \$800 per person. For each additional person who signs up, the cost for each person will be reduced by \$2. Find the maximum revenue for the airline company and the cost of the flight that produces maximum revenue.
3. Use a linearization to complete the following.
 - a. Estimate the value of $\sin \frac{\pi}{5}$.
 - b. Is the estimate you calculated smaller than or larger than the true value of $\sin \frac{\pi}{5}$? Explain your answer.

4. A cylindrical coffee cup that is 7 inches tall has an inner radius of 2.85 inches and an outer radius of 3 inches. Use differentials to approximate the number of cubic inches of material in the cup. $V = \pi r^2 h$

5. The radius of a sphere is measured to be 3 inches with a possible error of 0.01 inches.

a. Use differentials to estimate an upper and lower bound for the surface area of the sphere. $SA = 4\pi r^2$

b. Use differentials to estimate the percent error in calculating the surface area of the sphere.