Math 131 - Assignment 8

Name _____

March 27, 2024

Score _____

Show all work to receive full credit. Supply explanations when necessary. Use extra paper as necessary. This assignment is due April 3.

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1. A particle is moving along the graph of $y = \sqrt{x}$ in such a way that $\frac{dx}{dt} = 5$. Find $\frac{dy}{dt}$ when $x = 9$.

2. Suppose that the infected region of an injury is circular, and its radius is growing at the rate of 1.2 mm/hr. Find the rate of change of the area of the infected region when the radius is 3.4 mm.

3. A girl on flat ground flies a kite at a height of 60 ft. The wind carries the kite horizontally away from her at a rate of 5 ft/sec. How fast is the distance (diagonally) between the girl and the kite increasing when the kite is 150 ft away from her?

4. Let $f(x) = \dfrac{1}{x} + \sqrt[3]{x}$.

(a) Determine the linearization of f at $x = 8$. Write your answer in exact form (fractions, not decimals).

(b) Use your linearization to approximate $f(8.1)$. Round to the 6th decimal place.

5. Some values of $f(x)$ and $f'(x)$ near $x = 1$ are given in the table below.

x	0.50	0.75	1.00	1.25	1.50
$f(x)$	6.08	6.90	8.00	9.41	11.14
$f'(x)$	2.74	3.82	5.00	6.26	7.60

(a) Determine the linearization of f at $x = 1$.

(b) Use the linearization you found above to approximate $f(0.75)$.

6. Find the linearization of $f(x) = x^2 + x^{1/2} + \dfrac{1}{x}$ at $x = 1$, then use it to approximate $f(0.98)$.

7. Use differentials to approximate the change in $y = \sqrt{x^3 + 1}$ as x changes from 2 to 2.07.

8. Determine the differential dy.

   (a) $y = 5^{x^2+1}$

   (b) $y = \cot^{-1}(\sqrt{x})$

9. Use differentials to approximate the change in $y = \dfrac{1}{1-x}$ as x changes from 2 to 1.98.

10. Suppose that the percent error in measuring the side length of a cube is 2%. Use differentials to estimate the percent error in computing the cube's volume.