MATH 131: WORKSHEET 9

Derivatives practice & Related rates

(1) If I provide the function, you provide the derivative... conversely, if I provide the derivative, you provide a possible function.

$f(x) = \tan^{-1}(x) \qquad f'(x) = $ ________

$f(x) = $ ________ $\qquad f'(x) = \cos(x)$

$f(x) = $ ________ $\qquad f'(x) = \dfrac{1}{x}$

$f(x) = \sqrt{x^2+1} \qquad f'(x) = $ ________

$f(x) = $ ________ $\qquad f'(x) = e^{3x}$

$f(x) = \tan(x) \qquad f'(x) = $ ________

$f(x) = $ ________ $\qquad f'(x) = \dfrac{1}{\sqrt{1-x^2}}$

(2) Suppose we have a circle that is changing in size. There are three quantities that we can use to measure the size the circle: the radius r, the area A, and the perimeter P.

(a) What are the formulas that relate r, A, and P?

(b) Since the circle is changing in size, all three quantities r, A, and P should be considered to be functions of time t. Take the derivative $\frac{d}{dt}$ of the formulas you found above in order to find relationships between $\frac{dr}{dt}$, $\frac{dA}{dt}$, and $\frac{dP}{dt}$.

(c) Suppose at some moment the radius of the circle is 2 meters and at that same moment the radius is growing at a rate of 4 meters per second. At what rate is the area growing at that moment? At what rate is the perimeter growing at that moment?

(d) Suppose at some moment that the area of the circle is 5 square meters and is growing at a rate 7 square meters per minute. At what rate is the perimeter growing at that moment?

(3) Suppose that a square is shrinking in such a way that the area is decreasing at a constant rate of 10 square meters per hour. At what rate is the perimeter changing at the moment when the sides of the square are 7 meters long?