

Key

Elements of Calculus I, MATH 180 Quiz 6
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Determine the following limits:

(1) If $y = f(x) = x^5(2x+1)^3$ find dy .

2 pts $dy = \underbrace{(3x^5(2x+1)^2 \cdot 2 + 5x^4(2x+1)^3)}_{1.5 \text{ pts}} dx$.5 pts

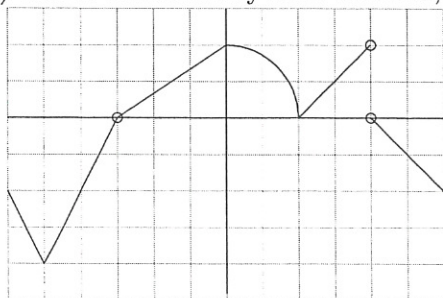
(2) Suppose a pebble is dropped in the water and circular rings emanate from the source where the pebble was dropped. If the rate at which the radius is increasing is a constant 0.5 feet per second, what is the rate at which the circumference of the circle is changing when the radius of the circle is 3 feet? (Hint: The formula for circumference is $C = 2\pi r$.)

1 pt $\frac{dC}{dt} = 2\pi \frac{dr}{dt} = 2\pi \cdot 0.5 = \pi \text{ ft/sec}$

4 pts

(3) Looking at the graph of $f(x)$ below where each grid division is one unit, identify:

- (a) The intervals where $f(x)$ is increasing, (b) The intervals where $f(x)$ is decreasing, (c) The x values of any local maxima, and (d) The x values of any local minima.



- a) $(-5, -3), (-3, 0), (2, 4)$ increasing
b) $(-6, -5), (0, 2), (4, 6)$ decreasing
c) max at $x=0$
d) min at $x=-5$ and $x=2$

Note
 $(-5, 0)$ on
(a) wrong
 -3 not
in domain

(4) Find the intervals where $f(x) = 3x - x^2$ is increasing or decreasing.

3 pts

$$f'(x) = 3 - 2x = 0 \Rightarrow x = \frac{3}{2}$$

$$\begin{array}{c} \text{++++} \quad \frac{3}{2} \quad \text{----} \\ \hline \text{increasing } (-\infty, \frac{3}{2}) \\ \text{decreasing } (\frac{3}{2}, \infty) \end{array}$$