

TMATH 124: Quiz 5 Key

Reasonable supporting work must be shown to earn credit.

1. [4] Use the graphs of f and g to find the following:

*Written hws #6,7
Concept check #1,2*

Product rule (+.5)
 $(f \cdot g)'(4)$
 $f'(4)$ (+.5)
 $g'(4)$ (+.5)
y coords (+.5)

Product Rule?
 $(f \cdot g)'(4) = f(4) \cdot g'(4) + f'(4) \cdot g(4)$
slope of line tang to g @ x=4
y coord of f
y coord of g
 $= 7 \cdot 0 + -1 \cdot 3 = -3$

Chain rule (+.5)
 $g'(8)$ (+.5)
 $f'(g(8))$ (+.5)
 $f'(2)$

Chain Rule?
 $(f \circ g)'(8) = f'(g(8)) \cdot g'(8)$
slope of line tang. to g @ x=8
 $= f'(2) \cdot \frac{-1}{2} = 1 \cdot \frac{-1}{2} = -\frac{1}{2}$

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2. A population of 3000 bacteria is introduced into a culture and grows. The population of bacteria, P , after t hours is modeled by

population at time t
 \downarrow
 $P(t) = 3000 \left(1 + \frac{4t}{50 + t^2} \right)$

Free/reading comprehension

(a) [1] Find how many bacteria there are after two hours.

plug in 2
get it/order of op

↑ population so P after 2 hours

$$P(2) = 3000 \left(1 + \frac{4(2)}{50 + 2^2} \right) = 3000 \left(\frac{54}{54} + \frac{8}{54} \right) = 3000 \left(\frac{62}{54} \right) \approx 3444$$

Worksheet #9
Concept check last?

(b) [3] Find the rate that the bacteria is growing after two hours.

→ slope/growth/derivative

$$P'(t) = \left[3000 \left(1 + \frac{4t}{50 + t^2} \right) \right]'$$

$$= 3000 \left[\frac{(1)' + (4t)'}{(50 + t^2)^2} - \frac{4t(2t)'}{(50 + t^2)^2} \right]$$

$$= 3000 \left[\frac{1 + 4 - 8t^2}{(50 + t^2)^2} \right]$$

quotient rule

plugging in
order of op

$$P'(2) = 3000 \left(\frac{(50+4)4 - 8(4)}{(50+4)^2} \right) \approx 189 \text{ bacteria/hour}$$

Worksheet #5

(c) [2] Find the line tangent to the graph of P when $t = 2$.

looking for $y - y_1 = m(x - x_1)$

$$(a) \Rightarrow y - 3444 = m(x - 2) \quad \text{and} \quad (b) \Rightarrow y - 3444 = 189(x - 2)$$

