232 Quiz 2
September 9, 2011

Section: _____

Name: * key * V1

Name: _____

Work with your partner on each problem; do not split up problems or tasks. You must discuss each problem together and agree on a final solution. Hand in one quiz per group.

You may use your hand-written Notebooks but no other materials and no technology at all. Please keep your discussions quiet so as not to disturb or inform other groups.

1. If a quantity quadruples every 12 years, what is its yearly percentage growth rate? Show all work clearly and in order.

$Q(12) = 4Q_0$ and $Q(t) = Q_0(1+r)^t$

$\Rightarrow Q_0(1+r)^{12} = 4Q_0$ *

$\Rightarrow 1+r = \sqrt[12]{4}$

$\Rightarrow r = \boxed{\sqrt[12]{4} - 1}$

(* or: $12\ln(1+r) = \ln 4$

$\ln(1+r) = \frac{\ln 4}{12}$

$1+r = e^{\ln 4/12}$)

note $k = \frac{\ln 4}{12}$ is the continuous growth rate; starting w/ this and converting to yearly gives yearly rate $r = e^{\frac{\ln 4}{12}} - 1$ (equivalent)

2. Use implicit differentiation and the fact that $\log_3 x$ is the inverse of 3^x to prove that $\frac{d}{dx}(\log_3 x) = \frac{1}{(\ln 3)x}$. Make sure that all of your steps are clear.

$3^{\log_3 x} = x$ for all x (def. of inverses)

$\Rightarrow \frac{d}{dx}(3^{\log_3 x}) = \frac{d}{dx}(x)$

$\Rightarrow (\ln 3)\, 3^{\log_3 x} \cdot \frac{d}{dx}(\log_3 x) = 1$

$\Rightarrow \frac{d}{dx}(\log_3 x) = \frac{1}{(\ln 3)\, 3^{\log_3 x}} = \frac{1}{(\ln 3)\, x}$. □