Name: _____ Math 211 Quiz 6

Section: 322 □ 323 □ Oct 25, 2012

1. (10 pts) Find the absolute maximum and minimum values of f on the given interval.

$$f(x) = x^4 - 2x^2 + 3, \quad [-2, 2]$$

$f'(x) = 4x^3 - 4x = 4x(x^2 - 1)$

$f'(x) = 0 \Rightarrow x = 0, \pm 1$

$f(0) = 3 \qquad f(2) = 11$

$f(1) = 2 \qquad f(-2) = 11$

$f(-1) = 2$

max @ ~~(0,3)~~ $(2, 11)$, $(-2, 11)$

min @ $(1, 2)$, $(-1, 2)$

2. (10 pts) The annual demand q for bottles of wine from a vineyard when the bottles are priced at p dollars each satisfies the equation $qe^{0.03p} = 5000$. The price is currently \$14 per bottle. Find the rate at which demand changes (with respect to time) if the price increases at a rate of \$1.20 per year.

$$\frac{d}{dt}\left(qe^{0.03p}\right) = 0$$

$$\frac{dq}{dt}e^{0.03p} + qe^{0.03p}(0.03)\frac{dp}{dt} = 0$$

$\left(p = 14, \ \frac{dp}{dt} = 1.2, \ \text{find } \frac{dq}{dt}\right)$

$$\frac{dq}{dt} = \frac{-0.03q\frac{dp}{dt}e^{0.03p}}{e^{0.03p}} = (-0.03)(1.2)q$$

$\left(q = 5000e^{-0.03p} = 5000e^{-(0.03)14}\right)$

$$\frac{dq}{dt} = -(0.03)(1.2)5000e^{-(0.03)14}$$

$$\approx -118 \quad (\text{bottles/year})$$