## WEEK 4 - Unit 3 Review HW!

Date $\qquad$ Period

## Solve each related rate problem.

1) A hypothetical square grows so that the length of its diagonals are increasing at a rate of 2 $\mathrm{m} / \mathrm{min}$. How fast is the area of the square increasing when the diagonals are 4 m each?
2) A conical paper cup is 20 cm tall with a radius of 10 cm . The cup is being filled with water so that the water level rises at a rate of $4 \mathrm{~cm} / \mathrm{sec}$. At what rate is water being poured into the cup when the water level is 6 cm ?

## Solve each optimization problem.

$3)$ Which points on the graph of $y=3-x^{2}$ are closest to the point $(0,2)$ ?

4) A geometry student wants to draw a rectangle inscribed in the ellipse $x^{2}+4 y^{2}=25$. What is the area of the largest rectangle that the student can draw?


For each problem, find a linear approximation of the given quantity.
5) $\sqrt[3]{8.4}$
6) $\sin 92^{\circ}$

1) $A=$ area of square $x=$ length of diagonals $t=$ time Equation: $A=\frac{x^{2}}{2} \quad$ Given rate: $\frac{d x}{d t}=2 \quad$ Find: $\left.\frac{d A}{d t}\right|_{x=4}$

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\left.\frac{d A}{d t}\right|_{x=4}=x \cdot \frac{d x}{d t}=8 \mathrm{~m}^{2} / \mathrm{min}
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2) $V=$ volume of material in cone $h=$ height $t=$ time Equation: $V=\frac{\pi h^{3}}{12} \quad$ Given rate: $\frac{d h}{d t}=4 \quad$ Find: $\left.\frac{d V}{d t}\right|_{h=6}$ $\left.\frac{d V}{d t}\right|_{h=6}=\frac{\pi h^{2}}{4} \cdot \frac{d h}{d t}=36 \pi \mathrm{~cm}^{3} / \mathrm{sec}$
3) $\left(-\frac{\sqrt{2}}{2}, \frac{5}{2}\right),\left(\frac{\sqrt{2}}{2}, \frac{5}{2}\right)$
4) 25
5) $\frac{61}{30} \approx 2.0333$
6) 1
