Name: $\qquad$ Solution Section: $\qquad$ 11
Clear your desk of everything except pens, pencils and erasers. Show all your work.
If you have a question raise your hand and I will come to you.

1. (5 points) Find the length of the curve given by $y=\frac{4 \sqrt{2}}{3} x^{3 / 2}-1$ for $0 \leq x \leq 1$ (Recall that $L=\int_{a}^{b} \sqrt{1+\left[f^{\prime}(x)\right]^{2}} d x$ )

$$
\begin{aligned}
& f^{\prime}(x)=\frac{4 \sqrt{2}}{3} \cdot \frac{3}{2} \cdot x^{\frac{1}{2}}=\left.2 \sqrt{2} \cdot \sqrt{x}\right|_{0} L=\int_{0}^{1} \sqrt{1+8 x} d x \\
& \left(f^{\prime}(x)\right)^{2}=2^{2} \cdot 2 \cdot x=8 x \cdot \quad \text { Let } u=1+8 x \cdot \frac{d u}{8}=d x \\
& L=\int_{1}^{9} \sqrt{u} \frac{d u}{8}=\frac{1}{8} \int_{1}^{9} u^{1 / 2} d u=\left.\frac{1}{8} \frac{u^{3 / 2}}{\frac{3}{2}}\right|_{1} ^{9}=\left.\frac{2}{3} \cdot \frac{1}{8} \cdot u \sqrt{u}\right|_{1} ^{9} \\
& \\
& =\frac{1}{12}(9 \sqrt{9}-1 \cdot \sqrt{1})=\frac{1}{12}(27-1)=\frac{26}{12}
\end{aligned}
$$

2. (5 points) Find the equation in $x$ and $y$ for the line tangent to the curve given parametrically by $x=10 \sin 2 t, \quad y=10 \cos 2 t$
at the point on the curve associated with $t=\frac{\pi}{8}$.

$$
\begin{aligned}
& \frac{d x}{d t}=20 \cos (2 t), \frac{d y}{d t}=-20 \sin (2 t) \\
& \frac{d y}{d x}=\frac{d y / d t}{d x / d t}=-\tan (2 t) \\
& m=\left.\frac{d y}{d x}\right|_{t=\frac{\pi}{8}}=-\tan \left(\frac{\pi}{4}\right)=-1 \\
& x(\pi / 8)=10 \sin \left(\frac{\pi}{4}\right)=5 \sqrt{2}, \quad y(\pi / 8)=10 \cos (\pi / 4)=5 \sqrt{2} \\
& \text { Emu of tangent line: } y-5 \sqrt{2}=-(x-5 \sqrt{2})
\end{aligned}
$$

