Name: Key *Student ID:*
No Calculators.

1. (*7 pts*) The estimate $\sqrt{1+x} = 1 + \frac{x}{2}$ is used when x is small. Estimate the error when $|x| < 0.1$.

Hint : $\frac{1}{(\frac{9}{10})^{3/2}} \approx 1.17$

The Taylor Polynomial of f order 1 centered at $x=0$ is

$P_1(x) = \sum_{k=0}^{1} \frac{f^{(k)}(0)\, x^k}{k!}$ where $f^{(1)}(x) = \frac{1}{2\sqrt{1+x}}$

So $P_1(x) = 1 + \frac{1}{2}x$ therefore $R_1(x) = \frac{f^{(2)}(c)\, x^2}{2!}$

where $f^{(2)}(x) = \frac{-1}{4(1+x)^{3/2}}$ and c is between 0 & x

if $|x| < \frac{1}{10}$ then $|R_1(x)| = \frac{1}{4}\left|\frac{1}{(1-c)^{3/2}}\right| |x|^2 \leq \frac{1}{4}|x|^2 \frac{12}{10}$

$= \frac{1}{30}|x|^2 < \frac{1}{3000}$ is the estimate of the error. largest when $c = -\frac{1}{10}$

2. (*3 pts*) Find the distance between points $P1$ and $P2$. $P1(3,4,5)$ and $P2(2,3,4)$.

$\sqrt{(3-2)^2 + (4-3)^2 + (5-4)^2} = \sqrt{3}$ //