Taylor Polynomials and Taylor's Inequality <u>Calculus: 2nd Edition</u> by Dennis Berkey

1*a*. Find the 3rd order Taylor polynomial for $f(x) = \ln(x+1)$ centered at $x = 0$.

b. Then find the Lagrange Error Bound when $x = .2$

2*a*. Find the 3rd order Taylor polynomial for $f(x) = e^x$ centered at $x = 0$.

b. Then use Taylors Inequality to find $|f(.4) - P_3(.4)| \le R$ at $x = .4$

3*a*. Find the 3rd order Taylor polynomial for $f(x) = \sin x$ centered at $x = \frac{\pi}{6}$.

b. Then use the Remainder Estimation Thm to find $|f(x) - P_3(x)| \le R$ at $x = 32^\circ$

4*a*. Find the 2nd order Taylor polynomial for $f(x) = \cos x$ centered at $x = \frac{\pi}{4}$.

b. Then use the Remainder Estimation Thm to find $|f(x) - P_2(x)| \le R$ at $x = 42^\circ$

5*a*. Find the 3rd order Taylor polynomial for $f(x) = \arcsin x$ centered at $x = 0$.

b. Then find the Lagrange Error Bound when $x = .2$

6*a*. Find the 1st order Taylor polynomial for $f(x) = \frac{\ln x}{x}$ centered at $x = 1$.

b. Then use Taylors Inequality to find $|f(1.2) - P_1(1.2)| \le R$ at $x = 1.2$

7*a*. Find the 1st order Taylor polynomial for $f(x) = xe^{-2x}$ centered at $x = 0$.

b. Then use Taylors Inequality to find $|f(.2) - P_3(.2)| \le R$ at $x = .2$

8*a*. Find the 1st order Taylor polynomial for $f(x) = \sqrt{3+x^2}$ centered at $x = 1$

b. Then find the Lagrange Error Bound when $x = 1.2$

Determine a bound on the accuracy of the given approximation for the indicated range of x

9. $\sin x \approx x, \qquad |x| < .05$

10. $\sin x \approx x - \frac{x^3}{3!}, \qquad |x| < .15$

11. $\cos x \approx \frac{1}{2} - \frac{\sqrt{3}}{2}\left(x - \frac{\pi}{3}\right), \qquad \left|x - \frac{\pi}{3}\right| < .05$

12. $\tan x \approx 1 + 2\left(x - \frac{\pi}{4}\right), \qquad \left|x - \frac{\pi}{4}\right| < \frac{\pi}{36}$

13. $\sqrt[3]{1+x} \approx 1 + \frac{x}{3} \qquad |x| < .025$

14. $\ln x \approx (x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3, \qquad |x-1| < ..1$

15. $\sqrt{1+x} \approx 1 + \frac{x}{2}, \qquad 0 < x < .02$