Section 9.7 – Maclaurin & Taylor Polynomials

Find the local quadratic approximation of *f* at $x = x_0$, and use that approximation to find the local linear approximation of *f* at x_0. Use a graphing utility to graph *f* and the two approximations on the same screen.

1. a. $f(x) = e^{-x};\ x_0 = 0$ b. $f(x) = \cos x;\ x_0 = 0$

3. a. Find the local quadratic approximation of $f(x) = \sqrt{x}$ at $x_0 = 1$.
   b. Use the result obtained in part (a) to approximate $\sqrt{1.1}$, and compare your approximation to that produced by your calculating utility. [Note: See Example 1 of section 3.5]

5. Use an appropriate local quadratic approximation to approximate $\tan 61^{\circ}$, and compare the approximation to that produced directly by your calculating utility.

7-16 Find the Maclaurin polynomials of orders *n*=0, 1, 2, 3, and 4, and then find the *n*th Maclaurin polynomials for the function in sigma notation.

7. e^{-x} 11. $\ln(1 + x)$ 15. $x \sin x$

17-24 Find the Taylor polynomials of orders *n*=0, 1, 2, 3, and 4 about $x = x_0$, and then find the *n*th Taylor polynomial for the function in sigma notation.

17. $e^x;\ x_0 = 1$ 19. $\frac{1}{x}; x_0 = -1$ 21. $\sin \pi x\,; x_0 = \frac{1}{2}$ 23. $\ln x\,; x_0 = 1$

25. a. Find the third Maclaurin polynomial for $f(x) = 1 + 2x - x^2 + x^3$
   b. Find the third Taylor polynomial about $x = 1$ for $f(x) = 1 + 2(x - 1) - (x - 1)^2 + (x - 1)^3$

Use the method of Example 7 to approximate the given expression to specified accuracy. Check your answer to that produced directly by your calculating utility.

35. $\sqrt{e}$; four decimal-place accuracy
36. $\frac{1}{e}$; three decimal-place accuracy

37. Which of the functions graphed in the following figure is most likely to have $p(x) = 1 - x + 2x^2$ as its second-order Maclaurin polynomial? Explain your reasoning.