Principles of Calculus Modeling: An Interactive Approach by Donald Kreider, Dwight Lahr, and Susan Diesel
Exercises for Section 2.13

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1. (1 pt)
Use Newton's method to approximate $\sqrt{11}$ by approximating the solution to the equation $x^2 - 11 = 0$.

Give the first 5 approximations to the root of the equation using initial approximation $x_0 = \frac{7}{2}$. Do the approximation for x_1 by hand, giving the numerator and denominator of the result. Reduce the fraction as much as possible. Use an applet or a computer algebra system such as Maple to calculate the remaining approximations.

x_0 : Numerator = _____ Denominator = _____
x_1 : Numerator = _____ Denominator = _____
$x_2 =$ _____
$x_3 =$ _____
$x_4 =$ _____
$x_5 =$ _____

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2. (1 pt)
Use Newton's method to approximate $\sqrt{46}$ by working with the equation $x^2 - 46 = 0$. Give the first 3 iterations, starting with $x_0 = 7$.

$x_1 =$ _____
$x_2 =$ _____
$x_3 =$ _____

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3. (1 pt)
Use Newton's method to approximate the solution to the equation $\sin(x) = 4 - x$. Give the first 6 iterations, starting with $x_0 = 4$.

$x_1 =$ _____
$x_2 =$ _____
$x_3 =$ _____
$x_4 =$ _____
$x_5 =$ _____
$x_6 =$ _____

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4. (1 pt)
Use Newton's method to approximate to four decimal places the solution to the equation $\cos(4x) = x^2$. How many roots are there? Enter the roots in increasing order. Use only as many answer boxes as you need; leave the rest blank.

First root = _____
Second root = _____
Third root = _____
Fourth root = _____

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5. (1 pt)
Use Newton's method to approximate a solution to the equation $x^3 - 6 = 0$. Give the first three iterations, starting with $x_0 = 3$.

$x_1 =$ _____
$x_2 =$ _____
$x_3 =$ _____

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6. (1 pt)
Use Newton's method to approximate a solution to the equation $x^4 - x^3 + 7x = 0$. Give the first four iterations, starting with $x_0 = 3.5$.

$x_1 =$ _____
$x_2 =$ _____
$x_3 =$ _____
$x_4 =$ _____

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7. (1 pt)
Use Newton's method to approximate $\sqrt{24}$. Give the first four iterations, starting with $x_0 = 12$.

$x_1 =$ _____
$x_2 =$ _____
$x_3 =$ _____
$x_4 =$ _____

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8. (1 pt)
Use Newton's method to approximate $\sqrt[3]{35}$. Give the first four iterations, starting with $x_0 = 8.75$.

$x_1 =$ _____
$x_2 =$ _____
$x_3 =$ _____
$x_4 =$ _____

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9. (1 pt)
Use Newton's method to approximate $\sqrt[4]{25}$. Give the first four iterations, starting with $x_0 = \frac{25}{4}$.

$x_1 =$ _____
$x_2 =$ _____
$x_3 =$ _____
$x_4 =$ _____

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10. (1 pt)
Work out an exact formula for t_{43} in terms of t_1 for Newton's Method applied to the function $f(t) = t^2$. Let $x = t_1$ and write your answer in terms of x.

$t_{43} =$ _____