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Math 440
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1.
a.
$x = \frac{3}{x}$
$x^2 = 3$
$x = \pm\sqrt{3}$
b.
$x = x^2 - 2x + 2$
$0 = x^2 - 3x + 2$
$0 = (x - 2)(x - 1)$
$x = 2, 1$
c.
$x = x^2 - 4x + 2$
$0 = x^2 - 5x + 2$
$x = \frac{5}{2} \pm \frac{\sqrt{17}}{2}$

2.
a.
$x = \frac{x+6}{3x-2}$
$x(3x - 2 = x + 6$
$3x^2 - 2x = x + 6$
$3x^2 - x - 6$
$x = \frac{1}{6} \pm \frac{73}{6}$
b.
$x = \frac{8+2x}{2+x^2}$
$x(2 + x^2) = 8 + 2x$
$x^3 + 2x = 8 + 2x$
$x^3 = 8$
$x = 2$
c.
$x = x^5$
$0 = x^5 - x$
$0 = x(x^4 - 1)$
$x = -1, 0, 1$

3.
a.

$g(1) = \frac{1^3+1-6}{6(1)-10}$
$g(1) = \frac{-4}{-4} = 1$
$g(2) = \frac{2^3+2-6}{6(2)-10}$
$g(2) = \frac{4}{2} = 2$
$g(3) = \frac{3^3+3-6}{6(3)-10}$
$g(2) = \frac{24}{8} = 3$
b.
$g(1) = \frac{6+6(1)^2-1^3}{11}$
$g(1) = \frac{11}{11} = 1$
$g(2) = \frac{6+6(2)^2-2^3}{11}$
$g(2) = \frac{22}{11} = 2$
$g(3) = \frac{6+6(3)^2-3^3}{11}$
$g(3) = \frac{33}{11} = 3$

5.
a. Not a root.
$g(\sqrt{3}) = \frac{\sqrt{3}}{\sqrt{3}} \neq \sqrt{3}$
b. Is a root.
$g(\sqrt{3}) = \frac{2\sqrt{3}}{3} + \frac{1}{\sqrt{3}} = \frac{2\sqrt{3}}{3} + \frac{\sqrt{3}}{3} = \frac{3\sqrt{3}}{3} = \sqrt{3}$
c. Not a root.
$g(\sqrt{3}) = (\sqrt{3})^2 - \sqrt{3} = 3 - \sqrt{3} \neq \sqrt{3}$
d. Is a root.
$g(\sqrt{3}) = 1 + \frac{2}{\sqrt{3}+1} = 1 + \frac{2(\sqrt{3}-1)}{(\sqrt{3}+1)(\sqrt{3}-1)} = 1 + \frac{2(\sqrt{3}-1)}{2} = 1 + \sqrt{3} - 1 = \sqrt{3}$

11.
a. Three ways $x = g(x)$ can be written is: $x^3 + e^x = x, \sqrt[3]{x - e^x} = x, \ln(x - x^3) = x$
b. Three ways $x = g(x)$ can be written is: $\sqrt[3]{\frac{x^2-3x-2}{9}} = x, 3x^{-2} + 9x^3 - x^2 + x = x, \pm\sqrt{3x^{-2} + 9x^3} = x$

14.
a. Converges
$g(\sqrt{2}) = (\frac{1}{2})\sqrt{2} + \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} = \sqrt{2}$
b. Converges
$g(\sqrt{2}) = \frac{2\sqrt{2}}{3} + \frac{2}{3\sqrt{2}} = \frac{2\sqrt{2}}{3} + \frac{2\sqrt{2}}{6} = \frac{3\sqrt{2}}{3} = \sqrt{2}$
c. Converges
$g(\sqrt{2}) = \frac{3\sqrt{2}}{4} + \frac{1}{2\sqrt{2}} = \frac{3\sqrt{2}}{4} + \frac{\sqrt{2}}{4} = \sqrt{2}$

17. Showing $\frac{1}{2} and -1$ are roots for $f(x) = 2x^2 + x - 1$:
$f(\frac{1}{2}) = 2(\frac{1}{2})^2 + (\frac{1}{2}) - 1 = \frac{1}{2} + \frac{1}{2} - 1 = 0$
$f(-1) = 2(-1)^2 + (-1) - 1 = 2 - 2 = 0$
Two candidates for $g(x)$:

$g(x) = \sqrt{\frac{1-x}{2}}$ will find root $\frac{1}{2}$, but not root -1

$g(x) = -\sqrt{\frac{1-x}{2}}$ will find root -1, but not root $\frac{1}{2}$

25. I didnt leave myself enough time to do this problem.

1.
a. Using fpi on $g(x) = \frac{x^3-2}{2}$ starting at 0, after 61 steps found root $x = -0.73205081$
b. Using fpi on $g(x) = \ln(7-x)$ starting at 15, after 13 steps found root $x = 1.67282170$
c. Using fpi on $g(x) = \ln(4 - sin(x))$ starting at 1, after 10 steps found root $x = 1.12998050$

2.
a. Using fpi on $g(x) = \sqrt[5]{1-x}$ starting at 0, after 40 steps found root $x = 0.75487767$
b. Using fpi on $g(x) = \frac{sin(x)-5}{6}$ starting at 0, after 10 steps found root $x = -0.97089892$
c. Using fpi on $g(x) = e^{-x^2+3}$ starting at 0, after 19 steps found root $x = 5.04262145$

4.
a. Cubed root of 2 using fpi starting at 1, after 5 steps found root $x = 1.25992105$
b. Cubed root of 3 using fpi starting at 1, after 6 steps found root $x = 1.44224957$
c. Cubed root of 5 using fpi starting at 1, after 6 steps found root $x = 1.70997595$