Answers to Old Exam Question handed out on 2/4/03

(a) $X(z)$

$$X(z) = \frac{1 - \frac{4}{3}z^{-1}}{\left(1 - \frac{2}{3}z^{-1}\right)(1 - 2z^{-1})} \qquad \text{ROC: } \frac{2}{3} < |z| < 2$$

(b) $H(z)$

$$H(z) = \frac{2\left(1 - 2z^{-1}\right)}{1 + \frac{2}{3}z^{-1}} \qquad \text{ROC: } |z| > \frac{2}{3}$$

(c) Impulse response

$$h[n] = 2\left(-\frac{2}{3}\right)^{n} u[n] - 4\left(-\frac{2}{3}\right)^{n-1} u[n-1]$$

(d) System is stable.

(e) Difference equation:

$$y[n] + \frac{2}{3}y[n-1] = 2x[n] - 4x[n-1]$$