=63/85+5=69/85

Mihel HW2

1a) $\begin{pmatrix} .45 \\ .95 \\ .2 \\ -.05 \\ .6 \end{pmatrix} = x_{n-1}$ $\begin{pmatrix} .5 \\ .9 \\ .3 \\ -.1 \\ .5 \end{pmatrix} = x_n$ Absolute error $= \|\hat{x} - x\|_p$ $p=1$

$|.5-.45| + |.9-.95| + |.3-.2| + |-.1-(-.05)| + |.5-.6| = \underline{.35} = $ abs err

$\frac{.35}{.45+.95+.2+(-.05)+.06} = \underline{.156} = $ rel err

-2pts: use x_n in denom

b) $p=2$ abserr $= \sqrt{|.45-.5|^2 + |.9-.95|^2 + |.3-.2|^2 + |-.1-(-.05)|^2 + |.5-.6|^2} = \underline{.166}$

$\frac{.166}{\sqrt{|.5|^2+|.9|^2+|.3|^2+|-.1|^2+|.5|^2}} = \underline{.140} = $ relerr

c) $p=\infty$, so take max value diff $.95-.9 = \underline{.05} = $ abs err relerr $= \frac{.05}{.95} = \underline{.0526}$

-4pts: Max is the 0.2 and 0.3 pair; denom is the value form x_n

d) least restrictive is the lowest error, which converges faster, so $p=\infty$ is least restrictive

$\begin{pmatrix} .49 \\ .92 \\ .4 \\ -.09 \\ .51 \end{pmatrix} = x_{n-1}$ $p=1$ $|.5-.49| + |.9-.92| + |.3-.4| + |-.1-(-.09)| + |.5-.51| = \underline{.15} = $ abs err

$\frac{.15}{.49+.92+.4+(-.09)+.51} = \underline{.062} = $ rel err

-1pt: Use x_n in denom

$p=2$ $\sqrt{|.5-.49|^2 + |.9-.92|^2 + |.3-.4|^2 + |-.1+(-.09)|^2 + |.5-.51|^2} = \underline{.103} = $ abs err

$\frac{.103}{\sqrt{|.5|^2+|.9|^2+|.3|^2+|-.1|^2+|.5|^2}} = \underline{.087} = $ rel err

$p=\infty$ greatest difference $|.3-.4| = \underline{.1} = $ abs err $\frac{.1}{.92} = \underline{.108} = $ rel err

-1pt: use x_n in denom

p_∞ almost doubled; relerr increases as p increases. p_1 now has the lowest error, which means p_1 is least restrictive. This means no error sampling is best, and so it is wise, if time permits, to choose multiple values.

Error follows from above

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3a) $I = \int_2^4 \frac{x}{\sqrt{x^2-1}}\,dx$ $\quad u = x^2-1 \quad du = 2x\,dx \quad x\,dx = \frac{1}{2}\,du$ $\quad x=2 \; u=3 \quad x=4 \; u=15$

Substitute new values in:

$$I = \int_3^{15} u^{-\frac{1}{2}} \cdot \frac{1}{2}\,du \rightarrow \frac{1}{2}\int_3^{15} u^{-\frac{1}{2}}\,du = \frac{1}{2}\cdot\left[2u^{\frac{1}{2}}\right]_3^{15} = \underline{\underline{\sqrt{15}-\sqrt{3}}}$$ ANS

3c) -4pts: Order is h^4; trapezoidal is h

5) -10pts: Good attempt; major issue is referencing the data in the dictionary. It can be very helpful to practice printing elements of the dictionary to understand what you are getting and build up the full function slowly.