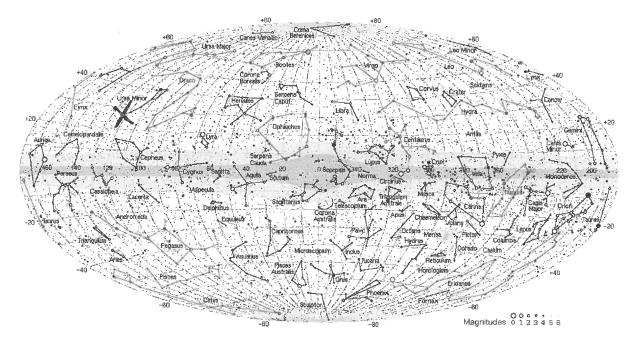(c) (2 pt) For the same two stars, what is the percentage decrease in flux using the two values of extinction?

3. A few (hopefully easy!) questions on positions...

(a) (2 pt) From Morgantown, what declinations are visible?

(b) (3 pt) From Morgantown, for how many hours in any given 24-hour period is a source of $\delta = -10°$ visible?

(c) (1 pt each) The HEASARC online coordinate converter is an excellent tool that you should become familiar with. Using this tool (available on https://heasarc.gsfc.nasa.gov/cgi-bin/Tools/convcoord/convcoord.pl , answer the following:

   i. What is the RA and Dec of the Galactic center in J2000 coordinates?

   ii. What is the Galactic latitude and longitude (l, b) of the J2000 north pole?

   iii. With a big dark X, mark the J2000 north pole position on this map of the sky (which shows the rough span of the Galactic plane at optical wavelengths in grey). Remember that latitudes range from –90 to +90 (either use the printed assignment or roughly reproduce this figure):

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HW #2

1) a) see plot

b) $B-V = -0.05$, $V = 6.5$

c) $m - M = 5 \log d - 5$

$d = 120 \qquad m = 6.5$

$M = 6.5 - 5 \log(120) + 5 = 1.10$

d) We know $L \propto M$, so if $t \propto L^{2.5}$

$t \propto M^{2.5}$ and

$$\frac{t_{pl}}{t_o} = \left(\frac{M_{pl}}{M_o}\right)^{2.5}$$

$$t_{pl} = 10^{10} \, yr \left(\frac{1.1}{4.8}\right)^{2.5} = 2.51 \times 10^8 \, yr$$

2) $X = \sec(z) = \dfrac{1}{\cos(z)}$

given elevation $= 30° \Rightarrow z = 60°$

$\Rightarrow X = 2.0$

5) $z_1 = 60°$

$z_2 = 60° - 10' = 60° - \frac{1}{6}° = 59.83°$

$m = m_0 + kX$, so $m - m_0 = kX$

$X_1 = 2.0$, so $0.14 \cdot 2.0 = 0.280$

$X_2 = \dfrac{1}{\cos(59.83°)} = 1.99$, so $0.14 \cdot 1.99 = 0.279$

$X_1 - X_2 = 0.001$

$\Delta m = k \, \Delta X = 0.0001$

c) $\dfrac{F_1}{F_2} = 10^{0.4(-0.0001)} = 0.999$, so 0.1%