Problem 1

(a) We can use the formula for angular resolution (with $d = R_E = 6.378 \times 10^6$ m) to calculate this:

$$\theta = \frac{1.22\lambda}{d} = \frac{1.22 \times 0.21 \text{ m}}{6.378 \times 10^6 \text{ m}} = 4.02 \times 10^{-8} \text{ rad}$$

(b) The effective diameter of the telescope would be increased to the distance between the Earth and the Moon. which side of Earth/Moon? does telescope work on far side of the moon? Using the same equation as above, the angular resolution would be

$$\theta = \frac{1.22\lambda}{d} = \frac{1.22 \times 0.21 \text{ m}}{3.844 \times 10^8 \text{ m}} = 6.66 \times 10^{-10} \text{ rad}.$$

Comparing this to the previous result, the angular resolution is increased by a factor of

$$\frac{\theta_1}{\theta_2} = \frac{4.02 \times 10^{-8} \text{ rad}}{6.66 \times 10^{-10} \text{ rad}} = 60.3 \text{ x}.$$

Problem 2

(a) The absolute magnitude of the star can be found using the distance modulus formula

$$m - M = 5\log(d) - 5,$$

where m is the apparent magnitude, M is the absolute magnitude, and d is the distance to the star in parsecs. Then we find that the absolute magnitude is

$$M = m - 5\log(d) + 5 = 21 - 5\log(3000) + 5 = 21 - 17.4 + 5 = 8.6.$$

The stellar type of Delorean would probably be M [1].

(b) We can rearrange the distance modulus equation, accounting for reddening, to isolate absolute magnitude:

$$d = 10^{(m-M+5-A)/5}$$
$$\Longrightarrow \log(d) = (m - M + 5 - A)/5$$
$$\Longrightarrow \quad M = m + 5 - A - 5\log(d)$$

The difference is just the $-A$ term, so we can avoid any calculations by simply observing that we can subtract units? is mag/pc the right one? how to properly estimate spectral type? the reddening value from our previous result.

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[1] https://sites.uni.edu/morgans/astro/course/Notes/section2/spectralmasses.html

- For a reddening value of 1 mag/pc, $M = 7.6$. This would probably be type K.
- For a reddening value of 2 mag/pc, $M = 6.6$. This would probably be type K.
- For a reddening value of 3 mag/pc, $M = 5.6$. This would probably be type G.

Reddening does make a difference in the estimation of Delorean's stellar type.

(c)

Problem 3

you want to point the telescope away from the galactic center since you cant see through it, and the brightness will interfere with pics

Problem 4