92. Parallax: $D\ (pc) = \frac{1}{p\ (arcsec)} = \frac{1}{0.002} = 500\ pc$

93. Distance modulus: $d\ (pc) = 10^{m-M+5/5} = 10^{(5.4+19.6+5)/5} = 10^{30/5} = 1{,}000{,}000\ pc$

94. Distance modulus is defined as m – M. The absolute magnitude M is defined to be the apparent magnitude at a distance of 10 pc, so m – M would equal zero at 10 pc.

    Alternately: $d\ (pc) = 10^{(0+5)/5} = 10^1 = 10\ pc$

95. By definition, 5 magnitudes is equal to a factor of 100 in brightness. So this object is now 1/100 times as bright.

    Alternately, use the distance modulus: Say the object originally has M = 0, m = 0.

    $d_0 = 10^{(0-0+5)/5} = 10^1 = 10\ pc$
    $d_{dim} = 10^{(5-0+5)/5} = 10^2 = 100\ pc$

    By the inverse square law, brightness (or flux) is proportional to $\frac{1}{d^2}$, so if the same object is 10 times further, it is 1/100 times as bright.

96. This question is based on the LRT relation, $L = R^2T^4$.
    a. $L_{new} = (5R)^2\ T^4 = 25\ L$
    b. $L_{new} = R^2\ (3T)^4 = 81\ L$
    c. $L_{new} = (8R)^2\ \left(\frac{1}{2}T\right)^4 = 64\ R^2 * \frac{1}{16}T^4 = 4\ L$

97. This question is based on the inverse square law, $\propto \frac{1}{d^2}$, which can also be written $\frac{F}{F_0} = \frac{d_0^2}{d^2}$.
    a. $F = \frac{(1\ AU)^2}{(0.4\ AU)^2}F_0 = \frac{1}{(2/5)^2}\left(1\frac{W}{m^2}\right) = \frac{25}{4}\left(1\frac{W}{m^2}\right) = 6.25\frac{W}{m^2}$
    b. $F = \frac{(1\ AU)^2}{(5\ AU)^2}F_0 = \frac{1}{25}\left(1\frac{W}{m^2}\right) = 0.04\frac{W}{m^2}$

98. This question and the next one are based on Wien's Law, $\lambda_{max} = \frac{b}{T}$. The constant b is usually equal to $2.898 * 10^6\ nm\ K$, but setting it equal to $3 * 10^6\ nm\ K$ makes things easier.
    a. $\lambda_{max} = \frac{(3*10^6\ nm\ K)}{30{,}000\ K} = 100\ nm$
    b. Ultraviolet (violet is ~300 nm)

99.
    a. $\lambda_{max} = \frac{(3*10^6\ nm\ K)}{3{,}000\ K} = 1000\ nm$
    b. Infrared (red is ~700 nm)

100.
    a. Use the Stefan-Boltzmann Law, $F = \sigma T^4$
       $F = \left(6 * 10^{-8}\frac{W}{m^2K^4}\right)(10{,}000\ K)^4 = \left(6 * 10^{-8}\frac{W}{m^2K^4}\right)10^{16}\ K^4 = 6 * 10^8\frac{W}{m^2}$
    b. Luminosity is just flux times area, in this case surface area.
       $L = F * A = \left(6 * 10^8\frac{W}{m^2}\right)(1 * 10^{19}\ m^2) = 6 * 10^{27}\ W$