Astrometry: (Seager Astrometry eq. 1)

$$\theta = 3\mu as \cdot \frac{m_p}{m_\oplus} \cdot (\frac{m_\star}{m_\odot})^{(-\frac{2}{3})} (\frac{P}{yr})^{(\frac{2}{3})} (\frac{d}{pc})^{(-1)}$$

Direct imaging (Seager direct imaging eq 13, 6, 7
Note: r is radius here

$$C = \frac{\dot{N}_\lambda(p)}{\dot{N}_\lambda(s)} = (\frac{r_p}{r_s})^2 \frac{exp(\frac{hc}{\lambda k_B T_\star})-1}{exp(\frac{hc}{\lambda k_B T_p})-1}$$

Microlensing:

This is not really easily calculated within the parameters of our model; we would need lens parameters, times, etc– talk about the limitations of this in the paper?

Radial Velocity- eq 14 Seager Radial Velocity
Choose m2 to be Jupiter's mass for this model. Look straight on the disk so sin i is 1. P is 1 yr

$$K_1 = \frac{28.4329\ m \cdot s^{-1}}{\sqrt{1-e^2}} \cdot \frac{m_2 sin\ i}{m_{jupiter}} (\frac{m_p + m_2}{M_\odot})^{(-2/3)} (\frac{P}{yr})^{(-1/3)}$$

Transit: eq 40 transit paper
We will find the maximum amplitude of the anomaly based off velocity during transit because this shows us how likely it will be to be able to detect the planet. b, the impact parameter, can be approximated as zero because of Earth's very low eccentricity. According to the paper, v sin i is 2 km s^-1 for a system like the sun's. k is the ratio of planet to star's ratios

Note: in the paper it discusses how looking at the velocity fluctuations can help us detect transits better than just the visual of light, because fuzziness etc can obscure what we can see

$$\Delta V = k^2 \sqrt{1 - b^2} (v_\star sin\ i_\star)$$