Mike Lafky
Homework 1

1.2

$\epsilon_x = 4 \times 10^{-9}$ m · rad

$\beta_x^* = 5$ m

(1.20) $\langle x^2 \rangle = \beta_x \epsilon_x = (5)(4 \times 10^{-9}\ \text{m} \cdot \text{rad})$

$= 20 \times 10^{-9}\ \text{m}^2 \cdot \text{rad}$

(1.15) $\sigma_x^2 = \langle x^2 \rangle = 20 \times 10^{-9}\ \text{m}^2$

$\sigma_x \approx 1.4 \times 10^{-4}$ m

$\beta_x^* \Rightarrow \langle x x' \rangle = 0 \Rightarrow \alpha_x = 0$

(1.21) $\beta_x \gamma_x - \alpha_x^2 = 1$

$5(\gamma_x) - 0^2 = 1$

$\gamma_x = \frac{1}{5}$

(1.20) $\langle x'^2 \rangle = \gamma_x \epsilon_x = \left(\frac{1}{5}\right)(4 \times 10^{-9}\ \text{m} \cdot \text{rad}) = 8 \times 10^{-10} \cdot \text{rad}$

$\sigma_{x'}^2 = \langle x'^2 \rangle = 8 \times 10^{-10}$ rad

$\sigma_{x'} = 2.8 \times 10^{-5}$