Physics 115A Eighth Problem Set

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1. Suppose that $\psi(x) = C \cdot x \cdot \exp\left[-(x-a)^2/(2\Delta^2)\right]$. Find:

    (a) The normalization constant C.
    (b) The expectation value of $\mathbf{x}$, $\langle \mathbf{x} \rangle$.
    (c) The expectation value of $\mathbf{x}^2$, $\langle \mathbf{x}^2 \rangle$.
    (d) The uncertainty, Δx.
    (e) The momentum space wave function, $\langle p|\psi \rangle = \psi(p)$.
    (f) The expectation value of $\mathbf{p}$, $\langle \mathbf{p} \rangle$.
    (g) The expectation value of $\mathbf{p}^2$, $\langle \mathbf{p}^2 \rangle$.
    (h) The momentum uncertainty, Δp.
    (i) The uncertainty product, $\Delta x \Delta p$.

2. Exercise 4.2.2, page 139 of your text.

3. Exercise 4.2.3, page 139 of your text.

4. Exercise 5.1.2, page 153 of your text.