(1) (a) (This part is #32 on p. 535; 8 points.) \( \sin^{-1}(\sin(3\pi/4)) = \sin^{-1}(\sqrt{2}/2) = \pi/4. \)

(b) (This part is like #7 on p. 542; 12 points.) Find the exact value of \( g'(1), \) given \( g(x) = \tan^{-1}(f(x)), \) \( f(1) = 2 \) and \( f'(1) = 3: \) using the chain rule \( g'(x) = \frac{1}{1+f'(x)} f'(x), \) so \( g'(1) = \frac{1}{1+f'(1)} f'(1) = \frac{1}{1+3} 3 = 3/5. \)

(2) (This problem is like #7, p. 566.) Use \( u = \ln(x), \) \( du = x^{-1} dx \), so \( v = x^{n+1}/(n+1) \) and \( du = dx/x; \) \( \int x^n \ln(x) dx = (n+1)/2 \) \( x^{n+1}/(n+1) - \int x^n/(n+1) dx = (n+1)/2 \) \( x^{n+1}/(n+1) - x^n/(n+1)^2 + C. \)

(3) (This problem is like #19, p. 585.) First, \( \frac{x^2}{x^2+1} = \frac{4x^2+1}{x^2+1} + C \), or \( x+1 = (Ax^2 + Bx) + C(x^2+1), \) so \( C = 1, A = -1, \) and \( B = 1. \) Now \( \int \frac{x^2}{x^2+1} dx = \int x^2 + 1 dx + \int \frac{1}{x} dx = -(1/2) \) \( x^2 + 1 + \arctan(x) + \ln|x| + C. \)

(4) (This problem is like #23, p. 560.) First, \( \int \frac{1}{x^3+6x+13} dx = \int \frac{1}{x^3+6x+13} dx + \int \frac{1}{x} dx = -(1/2) \) \( x^2 + 1 + \arctan(x) + \ln|x| + C. \)

(5) (This is #52, p. 618.) Note that \( \frac{x^2-2}{x^2+3} \leq \frac{x^2}{x^2+3} \leq \frac{x^2}{x^2+3}, \) and we know \( f_1 \frac{x^2}{x^2+3} dx \) converges, hence so does \( f_1 \frac{x^2-2}{x^2+3} dx. \)

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