(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 $g'(x) = \frac{1}{1+(f(x))^2}f'(x)$, so $g'(1) = \frac{1}{1+(f(1))^2}f'(1) = \frac{1}{1+2^2}3 = 3/5$.

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

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

(4) (This problem is like #23, p. 560.) First, $\int \frac{1}{x^2+6x+13}\,dx = \int \frac{1}{(x+3)^2+4}\,dx$. Now let $x+3 = 2\tan(t)$, giving $\int \frac{1}{(x+3)^2+4}\,dx = \int \frac{2\sec^2(t)}{4\tan^2(t)+4}\,dt = \int \frac{2\sec^2(t)}{4\sec^2(t)}\,dt = (1/2)t + C = (1/2)\arctan((x+3)/2) + C$.

(5) (This is #52, p. 618.) Note that $\frac{x^2-2}{x^4+3} \le \frac{x^2}{x^4+3} \le \frac{x^2}{x^4} = \frac{1}{x^2}$, and we know $\int_1^\infty \frac{1}{x^2}\,dx$ converges, hence so does $\int_1^\infty \frac{x^2-2}{x^4+3}\,dx$.

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