6. $\displaystyle\int_2^\infty \frac{dx}{(x+3)^{3/2}} = \lim_{t\to\infty}\int_2^t \frac{dx}{(x+3)^{3/2}} = \lim_{t\to\infty}\left[\frac{-2}{\sqrt{x+3}}\right]_2^t = \lim_{t\to\infty}\left[\frac{-2}{\sqrt{t+3}} + \frac{2}{\sqrt{5}}\right] = \frac{2}{\sqrt{5}}$. Convergent

7. $\int_0^\infty e^{-x}\,dx = \lim_{t\to\infty}\int_0^t e^{-x}\,dx = \lim_{t\to\infty}\left[-e^{-x}\right]_0^t = \lim_{t\to\infty}\left(-e^{-t}+1\right) = 1$. Convergent

8. $\displaystyle\int_{-\infty}^0 \frac{1}{2x-5}\,dx = \lim_{t\to-\infty}\int_t^0 \frac{1}{2x-5}\,dx = \lim_{t\to-\infty}\left[\tfrac{1}{2}\ln|2x-5|\right]_t^0 = \lim_{t\to\infty}\left[\tfrac{1}{2}\ln 5 - \tfrac{1}{2}\ln|2t-5|\right] = -\infty$.
Divergent

9. $\displaystyle\int_{-\infty}^{-1} \frac{1}{\sqrt{2-w}}\,dw = \lim_{t\to-\infty}\int_t^{-1} \frac{1}{\sqrt{2-w}}\,dw = \lim_{t\to-\infty}\left[-2\sqrt{2-w}\right]_t^{-1}$ $[u = 2-w,\ du = -dw]$

$\displaystyle = \lim_{t\to-\infty}\left[-2\sqrt{3} + 2\sqrt{2-t}\right] = \infty$. Divergent

10. $\int_{-\infty}^{-1} e^{-2t}\,dt = \lim_{x\to-\infty}\int_x^{-1} e^{-2t}\,dt = \lim_{x\to-\infty}\left[-\tfrac{1}{2}e^{-2t}\right]_x^{-1} = \lim_{x\to-\infty}\left[-\tfrac{1}{2}e^2 + \tfrac{1}{2}e^{-2x}\right] = \infty$. Divergent

11. $I = \int_{-\infty}^\infty x^3\,dx = I_1 + I_2 = \int_{-\infty}^0 x^3\,dx + \int_0^\infty x^3\,dx$, but $I_1 = \lim_{t\to-\infty}\left[\tfrac{1}{4}x^4\right]_t^0 = \lim_{t\to-\infty}\left(-\tfrac{1}{4}t^4\right) = -\infty$. Since I_1 is divergent, I is divergent, and there is no need to evaluate I_2. Divergent

12. $I = \int_{-\infty}^\infty (2-v^4)\,dv = I_1 + I_2 = \int_{-\infty}^0 (2-v^4)\,dv + \int_0^\infty (2-v^4)\,dv$, but
$I_1 = \lim_{t\to-\infty}\left[2v - \tfrac{1}{5}v^5\right]_t^0 = \lim_{t\to-\infty}\left(-2t + \tfrac{1}{5}t^5\right) = -\infty$. Since I_1 is divergent, I is divergent, and there is no need to evaluate I_2. Divergent

13. $\int_{-\infty}^\infty xe^{-x^2}\,dx = \int_{-\infty}^0 xe^{-x^2}\,dx + \int_0^\infty xe^{-x^2}\,dx$.

$\int_{-\infty}^0 xe^{-x^2}\,dx = \lim_{t\to-\infty}\left(-\tfrac{1}{2}\right)\left[e^{-x^2}\right]_t^0 = \lim_{t\to-\infty}\left(-\tfrac{1}{2}\right)\left(1 - e^{-t^2}\right) = -\tfrac{1}{2}\cdot 1 = -\tfrac{1}{2}$, and

$\int_0^\infty xe^{-x^2}\,dx = \lim_{t\to\infty}\left(-\tfrac{1}{2}\right)\left[e^{-x^2}\right]_0^t = \lim_{t\to\infty}\left(-\tfrac{1}{2}\right)\left(e^{-t^2} - 1\right) = -\tfrac{1}{2}\cdot(-1) = \tfrac{1}{2}$.

Therefore, $\int_{-\infty}^\infty xe^{-x^2}\,dx = -\tfrac{1}{2} + \tfrac{1}{2} = 0$. Convergent

14. $\int_{-\infty}^\infty x^2e^{-x^3}\,dx = \int_{-\infty}^0 x^2e^{-x^3}\,dx + \int_0^\infty x^2e^{-x^3}\,dx$, and

$\int_{-\infty}^0 x^2e^{-x^3}\,dx = \lim_{t\to-\infty}\left[-\tfrac{1}{3}e^{-x^3}\right]_t^0 = -\tfrac{1}{3} + \tfrac{1}{3}\left(\lim_{t\to-\infty} e^{-t^3}\right) = \infty$. Divergent