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Math 2020, Winter 2007, Quiz 2
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1. Compute $\int (\sqrt{x-1}+1)^{13}\,dx$.

2. Compute $\int \frac{1+\ln(x)}{x}\,dx$.

3. Compute $\int_{-1}^{2} \sqrt{t+2}\,dt$.

1. Let $u = \sqrt{x-1} + 1$, so $\sqrt{x-1} = u-1$.
Then $du = \frac{1}{2\sqrt{x-1}}\,dx$ so $dx = 2\sqrt{x-1}\,du = 2(u-1)\,du$.

$$\int (\sqrt{x-1}+1)^{13}\,dx = \int u^{13}\cdot 2(u-1)\,du = \int 2u^{14} - 2u^{13}\,du$$

$$= \frac{2}{15}u^{15} - \frac{2}{14}u^{14} + C = \boxed{\frac{2}{15}(\sqrt{x-1}+1)^{15} - \frac{1}{7}(\sqrt{x-1}+1)^{14} + C}$$

2. Let $u = 1+\ln x$. Then $du = \frac{1}{x}\,dx$ so

$$\int \frac{1+\ln x}{x}\,dx = \int u\,du = \frac{1}{2}u^2 + C = \boxed{\frac{1}{2}(1+\ln x)^2 + C}$$

3. $$\int \sqrt{t+2}\,dt = \frac{2}{3}(t+2)^{3/2} + C$$ so

$$\int_{-1}^{2} \sqrt{t+2}\,dt = \frac{2}{3}(t+2)^{3/2}\Big|_{-1}^{2} = \frac{2}{3}\left(4^{3/2} - 1^{3/2}\right) = \frac{2}{3}(8-1) = \boxed{\frac{14}{3}}$$