

7.2

#8.

$$\int_0^2 \frac{x+1}{\sqrt{2+3x}} dx$$

$$= \int_0^2 \frac{x}{\sqrt{2+3x}} dx + \int_0^2 \frac{1}{\sqrt{2+3x}} dx$$

↑
use the table

or

u-sub

#5 on table

a=2 b=3

↑
take the integral

$$u = 2+3x$$

$$du = 3 dx$$

$$\frac{1}{3} du = dx$$

$$x=0 \quad u=2$$

$$x=2 \quad u=8$$

$$= \frac{2}{3^3} (3x-4) \sqrt{2+3x} \Big|_0^2 + \frac{1}{3} \int_2^8 u^{-\frac{1}{2}} du$$

$$= \frac{2}{3^3} (2 \cdot 2\sqrt{2} - (-4\sqrt{2})) + \frac{1}{3} \cdot 2 u^{\frac{1}{2}} \Big|_2^8$$

$$= \frac{2}{3^3} (4\sqrt{2} + 4\sqrt{2}) + \frac{2}{3} (2\sqrt{2} - \sqrt{2})$$

$$= \frac{16\sqrt{2}}{27} + \frac{2\sqrt{2}}{3}$$

$$= \frac{34\sqrt{2}}{27}$$

7.2

#32.

$$\int (\ln x)^4 dx$$

use #29 on the table
or
by parts

$$u = (\ln x)^4$$

$$dv = dx$$

$$du = 4(\ln x)^3 \frac{1}{x} dx \quad v = x$$

$$= x(\ln x)^4 - 4 \int (\ln x)^3 dx$$

$$= x(\ln x)^4 - 4 \left[x(\ln x)^3 - 3 \int (\ln x)^2 dx \right]$$

$$u = (\ln x)^3$$

$$dv = dx$$

$$du = 3(\ln x)^2 \frac{1}{x} dx \quad v = x$$

$$= x(\ln x)^4 - 4x(\ln x)^3 + 12 \left(x(\ln x)^2 - 2 \int (\ln x) dx \right)$$

$$= x(\ln x)^4 - 4x(\ln x)^3 + 12x(\ln x)^2 - 24x \ln x + \int dx$$

$$= x(\ln x)^4 - 4x(\ln x)^3 + 12x(\ln x)^2 - 24x \ln x + x + C$$

#34

$$R(t) = \frac{3000}{\sqrt{4+t^2}}$$

$$u = \ln x \quad dv = dx$$

$$du = \frac{1}{x} dx \quad v = x$$

$$P = \int R(t) dt = \int_0^5 \frac{3000}{\sqrt{4+t^2}} dt$$

$$P = 3000 \int_0^5 \frac{1}{\sqrt{4+t^2}} dt \quad \text{using \#9 on table}$$

$$= 3000 \left(\ln |t + \sqrt{4+t^2}| \right) \Big|_0^5 \quad (20000)$$

$$= 3000 \left(\ln |5 + \sqrt{29}| - \ln 2 \right)$$

$$= 3000 \left(\ln \left(\frac{5 + \sqrt{29}}{2} \right) \right)$$

$$\approx 4942$$

if present is 20,000 then in 5 yrs pop is 24,942 ppl.

7.4

#24

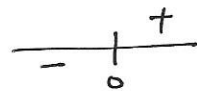
$$\begin{aligned}
 & \int_2^{\infty} \frac{3}{x} dx \\
 &= \lim_{b \rightarrow \infty} 3 \int_2^b \frac{1}{x} dx \\
 &= \lim_{b \rightarrow \infty} 3 \ln x \Big|_2^b \\
 &= \lim_{b \rightarrow \infty} 3 (\ln b - \ln 2) \\
 &= \infty \text{ diverges}
 \end{aligned}$$

$$\#28. \int_{-\infty}^0 \frac{1}{(4-x)^{3/2}} dx$$

$$\begin{aligned}
 &= \lim_{a \rightarrow -\infty} \int_a^0 (4-x)^{-3/2} dx \\
 &= \lim_{a \rightarrow -\infty} (-2) (4-x)^{-1/2} (-1) \Big|_a^0 \\
 &= \lim_{a \rightarrow -\infty} 2 \left(\frac{1}{2} - \frac{1}{\sqrt{4-a}} \right) \\
 &= 1
 \end{aligned}$$

#44. $\int_{-\infty}^{\infty} \frac{x e^{-x^2}}{1+e^{-x^2}} dx$

if $x=0$ then $y=0$



$$= \lim_{a \rightarrow -\infty} \int_a^0 \frac{x e^{-x^2}}{1+e^{-x^2}} dx + \lim_{b \rightarrow \infty} \int_0^b \frac{x e^{-x^2}}{1+e^{-x^2}} dx$$

$$= \lim_{a \rightarrow -\infty} \frac{1}{2} \int_{1+e^{-a^2}}^2 \frac{du}{u} - \lim_{b \rightarrow \infty} \frac{1}{2} \int_2^{1+e^{-b^2}} \frac{du}{u}$$

$$u = 1+e^{-x^2}$$

$$du = (e^{-x^2})(-2x) dx$$

$$-\frac{1}{2} du = x e^{-x^2} dx$$

$$= \lim_{a \rightarrow -\infty} \frac{1}{2} \ln u \Big|_{1+e^{-a^2}}^2$$

$$-\frac{1}{2} \lim_{b \rightarrow \infty} \ln u \Big|_2^{1+e^{-b^2}}$$

$$x=a \quad u=1+e^{-a^2}$$

$$x=0 \quad u=2$$

$$x=b \quad u=1+e^{-b^2}$$

$$= \lim_{a \rightarrow -\infty} \frac{1}{2} (\ln 2 - \ln(1+e^{-a^2})) - \frac{1}{2} \lim_{b \rightarrow \infty} (\ln(1+e^{-b^2}) - \ln 2)$$

$$= \frac{1}{2} \ln 2 + \frac{1}{2} \ln 2$$

$$= \ln 2$$