

6.5

$$31) P(t) = \frac{1000}{1 + e^{4.8 - .7t}}$$

$$= \frac{1000}{1 + e^{4.8} e^{-.7t}}$$

$$M = 1000$$

$$= \frac{1000}{1 + e^{4.8} e^{-.7t}}$$

$$-.7t = -Mkt$$

$$.7 = Mk$$

$$.7 = 1000k$$

$$.0007 = k$$

$$19) \int \frac{2x}{x^2-4} dx \quad u = x^2 - 4$$

$$du = 2x dx$$

$$\int \frac{1}{u} du$$

$$\ln|u| + C$$

$$\boxed{\ln|x^2-4| + C}$$

$$11) \int \frac{7 dx}{2x^2-5x-3} = \int \left(\frac{A}{2x+1} + \frac{B}{x-3} \right) dx = \int \left(\frac{-2}{2x+1} + \frac{1}{x-3} \right) dx$$

$$u = 2x+1$$

$$du = 2dx \leftarrow$$

$$A(x-3) + B(2x+1) = 7$$

$$x = -\frac{1}{2} \quad -3.5A = 7 \rightarrow A = -2$$

$$x = 3 \quad 7B = 7 \rightarrow B = 1$$

$$\int \frac{1}{u} du + \int \frac{1}{x-3} dx$$

$$-\ln|2x+1| + \ln|x-3| + C$$

$$\boxed{\ln \left| \frac{x-3}{2x+1} \right| + C}$$

$$A(x-3) + B(x+5)$$

$$2B(x+5)$$

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29) $\frac{dP}{dt} = .0002 P (1200 - P)$

$$y = \frac{M}{1 + Ae^{-kMt}}$$

$$y = \frac{1200}{1 + Ae^{-.0002(1200)t}}$$

$$= \frac{1200}{1 + Ae^{-.24t}} \rightarrow$$

$$y = \frac{1200}{1 + 59e^{-.24t}}$$

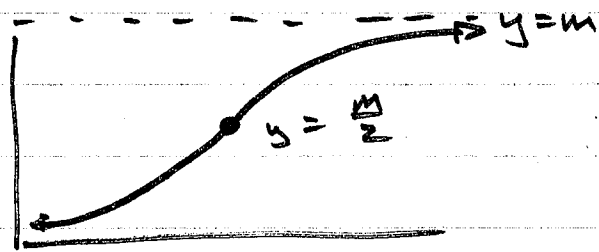
$$z_0 = \frac{1200}{1 + Ae^{-.24(z_0)}}$$

$$z_0 = \frac{1200}{1 + A}$$

$$z_0 + z_0 A = 1200$$

$$\frac{z_0 A}{z_0} = \frac{1180}{z_0}$$

$$A = 59$$



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$$10) \int \frac{3 dx}{x^2 + 9}$$

$$u^2 = x^2 \quad a^2 = 9$$

$$u = x \quad a = 3$$

$$du = dx$$

$$3 \frac{1}{3} \tan^{-1} \frac{x}{3} + C$$

$$\tan^{-1} \frac{x}{3} + C$$

$$9) \int \frac{2 dx}{x^2 + 1}$$

$$2 \tan^{-1} x + C$$

$$13) \int \frac{8x-7}{2x^2-x-3} dx = \int \frac{8x-7}{(2x-3)(x+1)} dx = \int \left(\frac{A}{2x-3} + \frac{B}{x+1} \right) dx$$

$$A(x+1) + B(2x-3) = 8x-7$$

$$x = -1$$

$$-5B = -15 \rightarrow B = 3$$

$$x = 3/2$$

$$2/5 \cdot 5/2 A = 5^2/5 \rightarrow A = 2$$

$$u = 2x-3$$

$$du = 2 dx$$

$$\int \left(\frac{2}{2x-3} + \frac{3}{x+1} \right) dx$$

$$\ln |2x-3| + 3 \ln |x+1| + C$$

$$\ln |2x-3| + \ln |x+1|^3 + C$$

~~$$\ln \left| \frac{2x-3}{(x+1)^2} \right| + C$$~~

$$\ln |(2x-3)(x+1)^3| + C$$

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$$\int \frac{2x^3}{x^2-4} dx$$

$$\int \left(2x + \frac{8x}{x^2-4} \right) dx$$

$$x^2 + \int \frac{8x}{x^2-4} dx$$

$$\begin{array}{r} x^2-4 \overline{) 2x^3 + 0x^2 + 0x + 0} \\ \underline{-(2x^3 - 8x)} \\ 8x \end{array}$$

$$u = x^2 - 4$$

$$du = 2x dx$$

$$+ 4 \int \frac{1}{u} du$$

$$x^2 + 4 \ln|u| + C$$

$$x^2 + 4 \ln|x^2-4| + C$$

$$\boxed{x^2 + \ln(x^2-4)^4 + C}$$

19] $\int \frac{2x}{x^2-4} dx$

$$u = x^2 - 4$$

$$du = 2x dx$$

$$\int \frac{1}{u} du$$

$$\ln|u| + C$$

$$\ln|x^2-4| + C$$

15] $\frac{dy}{dx} = \frac{2x-6}{x^2-2x}$

$$\int dy = \int \frac{2x-6}{x^2-2x} dx$$

$$y = \int \frac{2x-6}{x(x-2)} dx = \int \left(\frac{A}{x} + \frac{B}{x-2} \right) dx$$

$$A(x-2) + Bx = 2x-6$$

$$x=0 \quad -2A = -6 \rightarrow A=3$$

$$x=2 \quad 2B = -2 \rightarrow B=-1$$

$$\int \left(\frac{3}{x} - \frac{1}{x-2} \right) dx = 3 \ln|x| - \ln|x-2| + C = \boxed{\ln \left| \frac{x^3}{x-2} \right| + C}$$

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31) $\frac{dP}{dt} = 0.0004 P (250 - P)$

$$P = \frac{250}{1 + Ae^{-(0.0004)(250)t}} \rightarrow P = \frac{250}{1 + 7.929e^{-.1t}}$$

28) $P = \frac{250}{1 + Ae^0}$

$$250 = \frac{250}{1 + 7.929e^{-.1t}}$$

$$28(1 + A) = 250$$

$$250 + 1982e^{-.1t} = 250$$

$$28 + 28A = 250$$

$$1982e^{-.1t} = 0$$

$$28A = 222$$

$$e^{-.1t} = 0$$

$$A = \frac{222}{28} \approx 7.929$$

32) $P(t) = \frac{200}{1 + e^{5.3-t}}$

$$= \frac{200}{1 + e^{5.3-t}}$$

$$M = 200 \quad k = \frac{1}{200} \quad A = e^{5.3}$$

$$P(0) = \frac{200}{1 + e^{5.3}} \approx 993 \text{ people}$$

33) $\frac{dP}{dt} = .0015 P (150 - P)$

$$P = \frac{150}{1 + Ae^{-150(.0015)t}} \rightarrow P = \frac{150}{1 + 24e^{-.225t}}$$

$$6 = \frac{150}{1 + A}$$

$$100 = \frac{150}{1 + 24e^{-.225t}}$$

$$6 + 6A = 150$$

$$6A = 144 \rightarrow A = 24$$

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$$106 + 2400e^{-.225t} = 150$$

$$-100 \qquad \qquad \qquad -100$$

$$\frac{2400e^{-.225t}}{2400} = \frac{50}{2400}$$

$$\ln e^{-.225t} = \ln \frac{1}{48}$$

$$\frac{-.225t}{-.225} = \frac{\ln \frac{1}{48}}{-.225}$$

$$t = 17.21 \text{ weeks}$$

$$125 = \frac{150}{1 + 24e^{-.225t}}$$

$$125 + 3000e^{-.225t} = 150$$

$$-125 \qquad \qquad \qquad -125$$

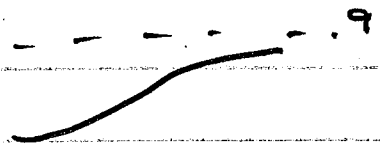
$$\frac{3000e^{-.225t}}{3000} = \frac{25}{3000}$$

$$\ln e^{-.225t} = \ln \frac{1}{120}$$

$$\frac{-.225t}{-.225} = \frac{\ln \frac{1}{120}}{-.225}$$

$$t = 21.28 \text{ weeks}$$

42) $\frac{dy}{dt} = \frac{0.9}{1 + 45e^{-.15t}} \quad B$



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31) $P(t) = \frac{1000}{1 + e^{4.8 - .7t}}$

$-.7 = km$

$P(t) = \frac{1000}{1 + e^{4.8} e^{-.7t}}$

$-.7 = \frac{k(1000)}{}$

$M = 1000 \quad k = -.0007 \quad A = e^{4.8}$

$P(0) = \frac{1000}{1 + e^{4.8}} \approx 8.163$

ABOUT 8 RABBITS RELEASED INITIALLY

41) $\frac{dy}{dt} = \frac{600}{1 + 59e^{-.1t}}$

$\frac{600}{2} = 300 \quad D$

