(1) $\int x^2\sqrt{7+4x^3}\,dx$

$u = 7+4x^3$

$du = 12x^2\,dx$

$\frac{1}{12}du = x^2\,dx$

$\frac{1}{12}\int u^{1/2}\,dx$

$\left(\frac{1}{12}\right)\frac{2}{3}u^{3/2} \longrightarrow \boxed{F(x) = \frac{1}{18}\sqrt{7+4x^3} + C}$

(2) $\int \frac{(\ln x)^5}{x}\,dx$ $\quad u = \ln x \quad du = \frac{1}{x}\,dx$

$\int u^5\,du$ $\quad \boxed{\frac{1}{6}(\ln x)^6 + C}$

(3) $\int_0^{\frac{\pi}{2}} e^{\sin x}\cos x\,dx$

$u = \sin x$

$du = \cos x\,dx$

$u\left(\frac{\pi}{2}\right) = 1$

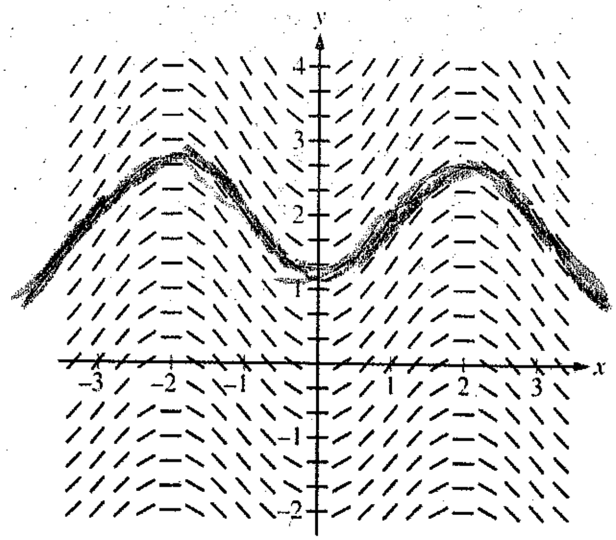
$u(0) = 0$

$\int_0^1 e^u\,du$

$e^u\Big|_0^1 = \boxed{e-1}$

5. Consider the differential equation $\frac{dy}{dx} = \frac{1}{2}\sin\left(\frac{\pi}{2}x\right)\sqrt{y+7}$. Let $y = f(x)$ be the particular solution to the differential equation with the initial condition $f(1) = 2$. The function f is defined for all real numbers.

(a) A portion of the slope field for the differential equation is given below. Sketch the solution curve through the point $(1, 2)$.



(5) d

$$\frac{dy}{dx} = \frac{1}{2}\sin\frac{\pi}{2}x\sqrt{y+7}$$

$$\frac{dy}{\sqrt{y+7}} = \frac{1}{2}\sin\frac{\pi}{2}x\,dx$$

$$\int (y+7)^{-\frac{1}{2}}dy = 2(y+7)^{\frac{1}{2}}$$

$$\int \frac{1}{2}\sin\frac{\pi}{2}x\,dx \qquad u=\frac{\pi}{2}x \quad du=\frac{\pi}{2}dx$$

$$\frac{2}{\pi}du = dx$$

$$\frac{1}{2}\cdot\frac{2}{\pi}\int \sin u\,du$$

$$-\frac{1}{\pi}\cos\left(\frac{\pi}{2}x\right)$$

$$2(y+7)^{\frac{1}{2}} = -\frac{1}{\pi}\cos\left(\frac{\pi}{2}x\right) + C \qquad (1,2)$$

$$2(2+7)^{\frac{1}{2}} = -\frac{1}{\pi}\cos\left(\frac{\pi}{2}(1)\right) + C$$

$$2\sqrt{9}$$

$$2\cdot 3 \rightarrow 6 = C$$

$$2(y+7)^{\frac{1}{2}} = -\frac{1}{\pi}\cos\left(\frac{\pi}{2}x\right) + 6$$

5d contin.

$$\sqrt{y+7} = -\frac{1}{2\pi}\cos\left(\frac{\pi}{2}x\right)+3$$

$$y+7 = \left(-\frac{1}{2\pi}\cos\left(\frac{\pi}{2}x\right)+3\right)^2$$

$$\boxed{y = \left(-\frac{1}{2\pi}\cos\left(\frac{\pi}{2}x\right)+3\right)^2 - 7}$$

(6) $\int \cos^{-1}(2x)\,dx$ LIATE

$u=2x$

$\cos^{-1}(2x)$	x
$\frac{2}{1+4x^2}$	dx

$-2\int \frac{x}{1+4x^2}\,dx$

$u = 1+4x^2$

$du = 8x\,dx$

$\frac{1}{8}du = x\,dx$

$$x\cos^{-1}(2x) - \int \frac{2x}{1+4x^2}\,dx$$

$$-\frac{1}{4}\int \frac{1}{u}\,du$$

$$\boxed{x\cos^{-1}(2x) - \frac{1}{4}\ln\left(1+4x^2\right) + C = F(x)}$$

(7) $\int e^x \sin x \, dx$ LIATE

$\sin x$	e^x
$\cos x\,dx$	$e^x\,dx$

$e^x \sin x - \int e^x \cos x \, dx$

$\cos x$	e^x
$-\sin x\,dx$	$e^x\,dx$

$e^x \sin x - \left(e^x \cos x + \int e^x \sin x \, dx\right) = \int e^x \sin x \, dx$

$e^x \sin x - e^x \cos x - \int e^x \sin x \, dx = \int e^x \sin x \, dx$

$e^x \sin x - e^x \cos x = 2 \int e^x \sin x \, dx$

$$\boxed{\frac{e^x \sin x - e^x \cos x}{2} = \int e^x \sin x \, dx}$$

(8) $\int x^2 \sin\left(\frac{1}{2}x\right) dx$

$$\begin{array}{ccc} x^2 & & \sin\left(\frac{1}{2}x\right) \\ & + & \\ 2x & & -2\cos\left(\frac{1}{2}x\right) \\ & - & \\ 2 & & -4\sin\left(\frac{1}{2}x\right) \\ & + & \\ 0 & & 8\cos\left(\frac{1}{2}x\right) \end{array}$$

$$\boxed{F(x) = -2x^2\cos\left(\tfrac{1}{2}x\right) + 8x\sin\left(\tfrac{1}{2}x\right) + 16\cos\left(\tfrac{1}{2}x\right) + C}$$

(9) $(8, 1.92)$ or if $T=8$ is the "initial value"

$(0, 1.92)$ $(4, 1.44)$

(a) $\frac{dM}{dT} = KT$ $M(T) = 1.92e^{KT}$

$1.44 = 1.92e^{4K}$

$-0.2877 = K$

(b) $\boxed{M(t) = 1.92e^{-0.2877T}}$

(C) $3.5 = 1.92e^{-.2877T}$

$1.8229 = e^{-.2877T}$

$\ln(1.8229) = -0.2877T$

$T \approx -2.087$ hrs so yes.

or $T = -8$

$1.92e^{-.2877(-8)} = 19.18$

They way over ~~administer~~ administer

Sue Them