HW: pg 444 1,5,9,15,21,27,31,47
pg 451 3a,3b,7a,7c,11

1) a) $u = x+1$ $du = dx$ $x=0 \Rightarrow u=1$ $x=2 \Rightarrow u=3$

$$\int_1^3 u^7\,du$$

b) $u = 8-x^2$ $du = -2x\,dx$ $x=-1 \Rightarrow u=7$ $x=2 \Rightarrow u=4$

$$-\frac{1}{2}\int_7^4 u^{\frac{1}{2}}\,du$$

1c) $u = \pi\theta \quad du = \pi\, d\theta \quad \theta = 1 \Rightarrow u = \pi \quad \theta = -1 \Rightarrow u = -\pi$

$$\frac{1}{\pi}\int_{-\pi}^{\pi} \sin u\, du$$

1d) $u = x - 3 \quad du = dx \quad x = 3 \Rightarrow u = 0 \quad x = 0 \Rightarrow u = -3$

$u + 3 = x$

$u + 5 = x + 2$

$$\int_{-3}^{0} (u+5)u^{20}\, du = \int_{-3}^{0} (u^{21} + 5u^{20})\, du$$

5) $\int_{-1}^{0} (1-2x)^3\,dx$ let $v = 1-2x$ $dv = -2dx$

$-\frac{1}{2}\int (1-2x)^3 -2dx = \frac{1}{2}\int v^3 dv = -\frac{1}{2}\frac{v^4}{4} + C$

$-\frac{1}{2}\frac{(1-2x)^4}{4}\Big|_{-1}^{0} = -\frac{1}{8}\left(1-81\right) = -\frac{1}{8}(-80) = 10$

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$x=-1 \Rightarrow v = 1-2(-1) = 3$

$x=0 \Rightarrow v = 1$

$-\frac{1}{2}\int_3^1 v^3 dv = -\frac{1}{2}\frac{v^4}{4}\Big|_3^1 = -\frac{1}{8}\left(1-81\right) = 10$

9) $\int_0^{\pi/2} 4\sin\left(\frac{x}{2}\right)dx$ let $u=\frac{x}{2}$ $du=\frac{1}{2}dx$

$4\cdot 2\int_{x=0}^{\pi/2} \sin u\,du = 8(-\sin u)+C$

$-8\sin\left(\frac{x}{2}\right)\Big|_0^{\pi/2} = -8\left(\sin\frac{\pi}{4}-0\right)$

$= -8\,\frac{1}{\sqrt{2}} = -\frac{8}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}}$

$= -4\sqrt{2}$

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or $x=0 \Rightarrow u=0$

$x=\frac{\pi}{2} \Rightarrow u=\frac{\pi}{4}$

$-8\sin u\Big|_0^{\pi/4} = -8\left(\sin\frac{\pi}{4}-\sin 0\right)$

$= -8\left(\frac{\sqrt{2}}{2}-0\right) = -4\sqrt{2}$

15) $\int_{\pi/3}^{\pi/2} \sin\theta\sqrt{1-4\cos^2\theta}\,d\theta$

$u = 2\cos\theta$

$du = -2\sin\theta\,d\theta$

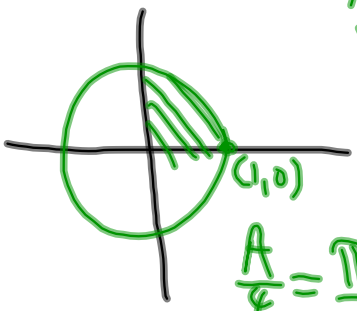
$\theta = \frac{\pi}{3} \Rightarrow u = 1$

$\theta = \frac{\pi}{2} \Rightarrow u = 0$

$-\frac{1}{2}\int_1^0 \sqrt{1-u^2}\,du$

$y^2 = 1-u^2$

$y^2+u^2 = 1$




$\frac{A}{4} = \frac{\pi(1)^2}{4}$

$\Rightarrow +\frac{1}{2}\int_0^1 \sqrt{1-u^2}\,du = \frac{1}{2}\cdot\frac{\pi}{4}$

$= \frac{\pi}{8}$

21) $f(x) = e^{-2x}$ $[0,4]$

$$f_{ave} = \frac{1}{4-0}\int_0^4 e^{-2x}\,dx = \frac{1}{4}\left(-\frac{1}{2}\right)e^{-2x}\Big|_0^4$$

$$= -\frac{1}{8}\left(e^{-8} - e^{0}\right) = -\frac{1}{8e^8} + \frac{1}{8}$$

27) $\int_1^3 \frac{x+2}{\sqrt{x^2+4x+7}}\,dx$

let $u = x^2+4x+7$

$du = (2x+4)\,dx$

$du = 2(x+2)\,dx$

$\frac{1}{2}\int_1^3 (x^2+4x+7)^{-\frac{1}{2}} 2(x+2)\,dx$

$\frac{1}{2}\cdot\frac{(x^2+4x+7)^{\frac{1}{2}}}{\frac{1}{2}}\Big|_1^3 = \sqrt{28}-\sqrt{12} = 2\sqrt{7}-2\sqrt{3}$

31) $\int_0^{\sqrt{\pi}} 5x\cos(x^2)\,dx$

let $u=x^2$ $du=2x\,dx$

$x=0 \Rightarrow u=0$

$x=\sqrt{\pi} \Rightarrow u=\pi$

$$\frac{5}{2}\int_0^{\sqrt{\pi}} \cos(x^2)\,2x\,dx$$

$$= \frac{5}{2}\int_0^{\pi} \cos u\,du = \frac{5}{2}\sin u\Big|_0^{\pi} = \frac{5}{2}(\sin\pi - \sin 0) = 0$$

47) $v(t) = 25 + 10e^{-0.05t}$

$$s(10) = \int_0^{10} 25 + 10e^{-0.05t}\,dt$$

$$25\int_0^{10} dt = 25t\Big|_0^{10} = 250$$

$$\frac{10}{-0.05}\int_0^{10} e^{-0.05t}(-0.05\,dt)$$

$$= -200\,e^{-0.05t}\Big|_0^{10}$$

$$= -200\left(e^{-.5} - 1\right)$$

$$= \frac{-200}{\sqrt{e}} + 200$$

$$450 - \frac{200}{\sqrt{e}}$$

$$= 329\text{ ft}$$