1) Area = $\int_2^5 \frac{x+3}{2}dx + \int_5^7 \frac{4x-8}{3}dx = \frac{245}{12}$ C

2) Area = $\int_{-\infty}^0 e^x dx + \int_0^\infty e^{-x}dx = 2$ D

3) Polar Area= $\frac{1}{2}\int_\alpha^\beta r^2 d\theta = \frac{1}{2}\int_{-\frac{\pi}{8}}^{\frac{\pi}{8}} (5\cos(4\theta))^2 d\theta = \frac{25\pi}{16}$ B

4) Using the disc method, the volume = $\pi\int_1^e \left(\frac{1}{x}\right)^2 dx = \frac{\pi(e-1)}{e}$ A

5) Area of solid= $\int_0^{\frac{\pi}{2}} \frac{\pi}{2}\left(\frac{\sin(2x)}{2}\right)^2 = \frac{\pi^2}{32}$ B

6) $\int_0^4 x\sqrt{1+x^4}\,dx \approx \frac{1}{2}\left[0\sqrt{1+0^4} + 2\left(1\sqrt{1+1^4}\right) + 2\left(2\sqrt{1+2^4}\right) + 2\left(3\sqrt{1+3^4}\right) + 4\sqrt{1+4^4}\right] \approx 68.889$ D

7) Area= $\int_1^2 \left[\left(-x^2+4x+5\right) - \left(\frac{-7x}{4} + \frac{39}{4}\right)\right]dx + \int_2^3 \left[\left(18 - \frac{9x}{2}\right) - \left(\frac{-7x}{4} + \frac{39}{4}\right)\right]dx = \frac{35}{12}$ A

8) $x^2+y^2+10x-6y-2=0$ is the circle centered at (-5,3) with radius 6. $\Rightarrow$Theorem of Pappus $\therefore$
Volume= $(\pi 6^2)(2\pi)(4- -5) = 648\pi^2$ E

9) Area of surface = $\int_0^\pi \left[(2\cos\theta)(\cos\theta)\sqrt{(2\cos\theta)^2 + \left(\frac{d}{d\theta}(2\cos\theta)\right)^2}\right]d\theta = 4\pi^2$ C

10) Volume= $2\pi\int_0^3 xe^{2x+1}dx = \frac{e\pi(5e^6+1)}{2}$ B

11) $\pi\int_0^{\frac{\pi}{4}} \left[\pi^2 - (\pi - \tan x)^2\right]dx = -\pi\int_0^{\frac{\pi}{4}} (\pi - \tan x)^2 dx + \frac{\pi^4}{4}$ C

12) $\int_a^{-1} [x(x+5)]dx = \frac{77}{6} = \frac{-a^3}{3} - \frac{5a^2}{2} + \frac{13}{6}$ $\therefore$ a= -8 E

13) Area= $\int_0^2 y^{\frac{7}{2}}dy = \frac{32\sqrt{2}}{9}$ D

14) $\frac{2\pi}{18}\left[-\pi\sin-\pi + 4\frac{-2\pi}{3}\sin\frac{-2\pi}{3} + 2\frac{-\pi}{3}\sin\frac{-\pi}{3} + 4(0)\sin(0) + 2\frac{\pi}{3}\sin\frac{\pi}{3} + 4\frac{2\pi}{3}\sin\frac{2\pi}{3} + \pi\sin(\pi)\right] \approx 6.33$
A

15) Surface area= $2\pi\int_a^b \sqrt{1+(y')^2}\,dx \Rightarrow 2\pi\int_0^{\frac{\pi}{4}} x\sqrt{\frac{x^4+2x^2+2}{x^4+2x^2+1}}dx$ B

16) Volume= $2\pi\int_1^2 \frac{x-1}{x^2+1}dx = 2\pi\left(\frac{\ln(5/2)}{2} + \arctan\left(\frac{1}{2}\right) - \frac{\pi}{4}\right)$ D

17) Volume= $\pi\int_3^7\left(-x^2+10x-21\right)^2dx=\frac{512\pi}{15}$ E

18) $x^2+y^2-8x+12y+27=0$ is a circle with radius 5 centered at (4,-6). Distance from point to line= $\frac{\left|5(4)+-12(-6)+77\right|}{\sqrt{5^2+(-12)^2}}$=13. Using the Theorem of Pappus, the surface area= ((2)5π)((2)13π)=260π^2 C

19) Volume= $\int_{-2}^{3}\frac{\sqrt{3}}{4}\left(6+y-y^2\right)^2dy=\frac{625\sqrt{3}}{24}$ C

20) Using the shell method with $p(x)=x^{\frac{a}{b}}$ and $r(x)$=(a+b-x), Volume= $2\pi\int_0^{a+b}x^{\frac{a}{b}}(a+b-x)dx$ A

21) Area of region= $\int_{-1}^{2}\left(x+1-\left(x^2-1\right)\right)dx=\frac{9}{2}$ Centroid of region is $\bar{x}=\frac{2}{9}\int_{-1}^{2}x\left(x+1-\left(x^2-1\right)\right)dx=\frac{1}{2}$

$\bar{y}=\frac{2}{9}\int_{-1}^{2}\left[\frac{(x+1)+\left(x^2-1\right)}{2}\left(x+1-\left(x^2-1\right)\right)\right]dx=\frac{3}{5}$ Point to line= $\frac{\left|1(1/2)+-1(3/5)+8\right|}{\sqrt{1^2+(-1)^2}}=\frac{79\sqrt{2}}{20}$

Volume= $2\pi\frac{79\sqrt{2}}{20}\frac{9}{2}=\frac{711\pi\sqrt{2}}{20}$ B

22) Volume= $2\pi\int_1^e x\ln x\,dx=\frac{\pi\left(e^2+1\right)}{2}$ B

23) $\int_0^1\tan x\,dx\approx$ .25tan(.25)+ .25tan(.50)+ .25tan(.75)+ .25tan(1)≈.823 D

24) Area= $\frac{1}{2}\int_{\frac{\pi}{3}}^{\frac{5\pi}{3}}(1-2\cos\theta)^2d\theta=\frac{3\sqrt{3}+4\pi}{2}$ A

25) Area= $\int_{\frac{1}{4}}^{\frac{4}{3}}(x+3)-(4-3x)dx+\int_{\frac{4}{3}}^{\frac{7}{2}}(x+3)-(3x-4)dx=\frac{169}{72}+\frac{169}{36}=\frac{169}{24}$ C

26) Area= $2\pi\int_1^4\frac{1+x}{\sqrt{x}}dx=\frac{40\pi}{3}$ E

27) Volume= $\pi\int_0^1\left(\sqrt{\arcsin x}\right)^2dx=\frac{\pi(\pi-2)}{2}$ D

28) Volume= $\int_0^1\frac{\left(\frac{4x^2}{\sqrt{2}}\right)^2}{2}dx=\int_0^1 4x^4dx\frac{4}{5}=$ C

29) Volume= $\pi\int_0^2\left(\frac{1}{\sqrt{x^2-7x+12}}\right)^2dx\Rightarrow$ Using partial fractions= $\pi\int_0^2\left(\frac{1}{x-4}-\frac{1}{x-3}\right)dx=\pi\ln\left(\frac{3}{2}\right)$ B

30) Area= $\int_0^{\frac{\pi}{4}}(\cos x-\sin x)dx=\sqrt{2}-1$ C