6) $\int_0^\pi e^{2x}\sin x\,dx = I$ by parts

(a) $\sin(e)$
(b) 1/5
(c) $(e^{2\pi}+1)/5$
(d) $\sin(e^{2\pi})+1$
(e) e^2
(f) none of the above

$$\begin{array}{lcl} \sin x & + & e^{2x} \\ \cos x & - & \frac{1}{2}e^{2x} \\ -\sin x & & \frac{1}{4}e^{2x} \end{array}$$

$$I = \frac{1}{2}\sin x\, e^{2x} - \frac{1}{4}e^{2x}\cos x - \frac{1}{4}I$$

$$I + \frac{1}{4}I = \left(\frac{1}{2}\sin x - \frac{1}{4}\cos x\right)e^{2x}$$

$$\frac{5}{4}I = \left(\frac{1}{2}\sin x - \frac{1}{4}\cos x\right)e^{2x}$$

$$I = \left(\frac{2}{5}\sin x - \frac{1}{5}\cos x\right)e^{2x} + C$$

$$\int_0^\pi e^{2x}\sin x\,dx =$$

$$= \left(\frac{2}{5}\sin\pi - \frac{1}{5}\cos\pi\right)e^{2\pi} - \left(0 - \frac{1}{5}\right)e^0$$

$$= \frac{1}{5}e^{2\pi} + \frac{1}{5} = (e^{2\pi}+1)/5$$

7) $\int_0^3 |4x-8|\,dx = 4\int_0^3 |x-2|\,dx$

(a) 11
(b) 10
(c) 13
(d) 8
(e) 23
(f) none of the above

$$= 4\left[\int_0^2 |x-2|\,dx + \int_2^3 |x-2|\,dx\right]$$

$$= 4\left[\int_0^2 (2-x)\,dx + \int_2^3 (x-2)\,dx\right]$$

$$= 4\left[\left[2x - \frac{1}{2}x^2\right]_0^2 + \left[\frac{1}{2}x^2 - 2x\right]_2^3\right]$$

or

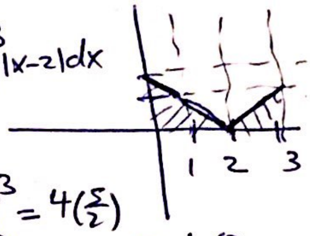
Area under the curve $= \int_0^3 |x-2|\,dx$

$=$ triangle 1 $+$ triangle 2

$= \frac{1}{2}(2)(2) + \frac{1}{2}(1)(1)$

$= 2 + \frac{1}{2} = 5/2 \Rightarrow \int_0^3 = 4\left(\frac{5}{2}\right)$

$= 10$



8) If $F(x) = \int_1^{x^2} \cos(3\pi \ln t)\,dt$ then $F'(1) =$

(a) -1
(b) e^2
(c) 0
(d) -2e
(e) 1
(f) none of the above

$$F'(x) = \cos(3\pi \ln x^2) * (2x)$$

$$F'(1) = \cos(0) * (2)$$

$$= 2$$

9) The sum of the series $\sum_{n=1}^{\infty} \frac{\pi^n}{n!}$ is equal to

(a) 1
(b) $e^\pi - 1$
(c) $e^\pi/\pi - 1$
(d) $e^\pi - \pi$
(e) e^π/π
(f) none of the above

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$

let $x = \pi$

$$e^\pi = \sum_{n=0}^{\infty} \frac{\pi^n}{n!}$$

$$e^\pi = \frac{\pi^0}{0!} + \sum_{n=1}^{\infty} \frac{\pi^n}{n!}$$

$$e^\pi = 1 + \sum_{n=1}^{\infty} \frac{\pi^n}{n!}$$

$$\Rightarrow e^\pi - 1 = \sum_{n=1}^{\infty} \frac{\pi^n}{n!}$$

10) $\int_0^{\pi/4} \sec^4 x \tan^4 x\,dx =$

(a) 2/57
(b) 1/12
(c) 12/35
(d) 1/6
(e) 2/7
(f) none of the above

$$\int \sec^2 x \tan^4 x \sec^2 x\,dx \qquad 1 + \tan^2 x = \sec^2 x$$

$$= \int (1+\tan^2 x)\tan^4 x \cdot \sec^2 x\,dx \qquad \text{let } u = \tan x$$

$$du = \sec^2 x\,dx$$

$$= \int (1+u^2)u^4\,du$$

$$\int_0^{\pi/4} \sec^4 x \tan^4 x\,dx = \int_0^1 (1+u^2)u^4\,du = \int_0^1 (u^4+u^6)\,du$$

$$= \left[\frac{1}{5}u^5 + \frac{1}{7}u^7\right]_0^1 = \frac{1}{5} + \frac{1}{7} = \frac{7+5}{35} = \frac{12}{35}$$