# FAMAT STATE BOWL

1. $S'(x) = 2 - 2x\sin(x^2)$ $\quad S''(x) = -2x\cos(x^2)\cdot 2x - 2\sin(x^2)$ (8)

2. $\frac{1}{2}(S(x)+x^2)^{-1/2}\cdot[S'(x)+2x]$ $\quad S(1)=1$, $S'(1)=-4$ $\quad \frac{1}{2}\cdot\frac{1}{\sqrt{2}}\cdot -2 = \frac{-1}{\sqrt{2}} = \frac{-\sqrt{2}}{2}$

3. $A = 2[3+8+15+20+26]$ $\quad B = 2[8+15+20+26+32]$

$C = 2[5+11+17+22+30]$ $\quad 144+202+170 = 516$

4. $\pi\int_0^{1.58545491}[(5-x^3)^2-(1-\cos x)^2]\,dx = 85.031$

5. B, C, D, E, F

6. $m_{norm} = \frac{1}{4}$ $\quad m_{tan} = -4$ $\quad -4 = 4a+2b$ $\quad S''(x) = 2ax+b$ $\quad 10 = 4a+b$ $\quad -4 = 4a+2b$ $\quad 14 = -b$ $\quad b = -14$ $\quad 10 = 4a-14$ $\quad 24 = 4a$ $\quad a = 6$

$S'(x) = 6x^2 - 14x$ $\quad S'(1) = -8$

7. $A = \frac{1}{5}\int_7^{12}\frac{1}{20}t(t-12)(24-t)\,dt = -16.438$ $\quad B = 12$

$C = 33.255$ $\quad D = \frac{T(13)-T(6)}{7} = 5.650$ $\quad 34.467$

8. $A(w) = \int_0^w (36x^2-18x^3)\,dx$

$\frac{dA}{dt} = (36w^2-18w^3)\frac{dw}{dt}$ $\quad (36(.5)^2-18(.5)^3)(.04) = .27$

9. $\int_{.8270906}^{6.1978908}(4\ln x-(1.5x-2))\,dx = 6.81412764$

$\int_0^{1.5378516}(2\cos x - e^x)\,dx = .31226518$ $\quad .046$

10. $(2,0)$ $\quad 4x^3+x\sec^2 y\,y'+\tan y = 0$ $\quad 32+2y'+0=0$ $\quad m_{tan} = -16$ $\quad 16x+y=32$ $\quad 16(2.1)+y=32$ $\quad -1.6$

11. $\int_{-4}^{-2}[(x+2)^2-2]\,dx - \int_{-2}^{0}x\,dx + \int_0^{\pi/4}\tan x\,dx + \int_{\pi/4}^{3}e^{x-\frac{\pi}{4}}\,dx$ $\quad 12.943$

12. A) T $\quad$ B) F $\quad$ C) F (limits) $\quad$ D) T $\quad$ E) $\frac{\pi}{4}$ $\quad$ F) F $\quad 4+\ln 8$

13. $S(x) = 2x(16-x^2) = 32x-2x^3$ $\quad S'(x) = 32-6x^2$ $\quad 16-3x^2=0$

$x = \sqrt{16/3} = \frac{4}{\sqrt{3}}$ $\quad 2\left(\frac{4\sqrt{3}}{3}\right)\left(16-\frac{16}{3}\right) = \frac{8\sqrt{3}}{3}\cdot\frac{32}{3} = \frac{256\sqrt{3}}{9}$

14. $\int_1^5 x^2\,dx = \left|\frac{x^3}{3}\right|_1^5 = \frac{125}{3}-\frac{1}{3} = \frac{124}{3}$ $\quad \frac{124}{3}+6 = \frac{142}{3}$

$+\int_1^5(3\sin(\pi x)+x+4)\,dx = 9+\int_1^5(-x+4)\,dx = 13$ $\quad \frac{142}{3}+13 = \frac{181}{3}$

15. $\int_{-2}^{2}|(-y^3+2y+4)-(y^2-2y)|\,dy$ $\quad m/6$