The following were changed at the resolution center at the convention: 26 A or B

1) \[ \int_{9}^{16} \frac{1}{\sqrt{x-4}} \, dx \] \[ \Rightarrow \int_{5}^{12} u^{-1/2} \, du \] \[ \Rightarrow 4\sqrt{3} - 2\sqrt{5} \] A

2) \[ y_{ave} = \frac{1}{3-1} \int_{1}^{3} (2 + x - x^{-2}) \, dx = \frac{1}{2} (6 + 9/2 + 1/3 - 2 - 1/2 - 1) = 11/3 \] A

3) \[ \int_{0}^{5} (|2-x|) \, dx = \int_{2}^{5} (2-x) \, dx - \int_{2}^{5} (x-2) \, dx = [(4 - 2) - (10 - 25/2 - (4 - 2))] = 13/2 \] D

4) \[ \int_{0}^{4} \frac{\sqrt{x^2+1}}{dx} \approx .5[1 + 2\sqrt{2} + 2\sqrt{5} + 2\sqrt{10} + \sqrt{17}] \] where \( \Delta x = (4-0)/2(4) = .5 \) C

5) \[ \int_{1}^{3} e^{x^2} \, dx = 2 \int_{1}^{3} u e^{u} \, du = 2[3e^3 - e^3 - (e - e)] = 4e^3 \] D

6) \[ V = 2\pi \int_{0}^{\epsilon} xe^x \, dx = 2\pi[xe^x - e^x] \bigg|_{0}^{\epsilon} = 2\pi[e^{\epsilon+1} - e^{\epsilon} + 1] \] E

7) \[ \int_{1}^{e^\pi} (e^{x} / x - \ln x + e^{-x}) \, dx = e^\pi - e^{-\pi} = 2[(e^\pi - e^{-\pi})/2] = 2\sinh \pi \] B

8) \[ y' = \cos(\pi x^3) \& y''_{x=2} = \cos(8\pi) = 1; \text{ so at (2, 0), tangent line equation is } x - y = 2 \] C

9) \[ \int_{0}^{\pi/2} \sin^2 \frac{2t}{\pi} \, dt = \frac{1}{4} \int_{0}^{3\pi/2} (1 - \cos 2u) \, du = \frac{1}{4} (u - \frac{1}{2} \sin 2u) \bigg|_{3\pi/2}^{\pi/2} = \frac{\pi}{8} \] D

10) \[ \int_{x}^{\log_{10}(x^{10}t)} \, dx = \frac{4}{\ln 10} \int_{1}^{\ln x} \frac{1}{x} \, dx + \int_{1}^{x} 1 \, dx = \frac{2}{\ln 10} (\ln x)^2 + x + C \] B

11) Improper integral, \[ \int_{0}^{2} \frac{1}{(2x - 1)^{2/3}} \, dx = \int_{0}^{1/2} \frac{1}{(2x - 1)^{2/3}} \, dx + \int_{1/2}^{2} \frac{1}{(2x - 1)^{2/3}} \, dx = 3/2 + 3\sqrt[3]{3}/2 \] D

12) \[ \frac{du}{dt} = \frac{t+3t^2}{u^2} \Rightarrow u^{3/3} = t^2/2 + t^3 + C \Rightarrow C = 216 \Rightarrow u = (3t^2/2 + 3t^3 + 216)^{1/3} \] C

13) So the \( x^{12} \) term of \( [x^3/2 - 2]^8 = \left( \frac{3}{2} \right)^4 (-2)^4 = 70t^{12} \) and the coefficient of \( x^{13} \) is \( 70/13 \) C

14) \[ \int \cos x \csc x \, dx = \int \cot x \, dx = \ln |\sin x| + C \] B

15) So \[ A = \frac{1}{2} \int_{-\pi/3}^{\pi/3} [(1 + 2 \cos \theta)^2 - 2^2] \, d\theta = \int_{0}^{\pi/3} (4 \cos \theta + 4 \cos^2 \theta - 3) \, d\theta = \frac{15\sqrt{3} - 2\pi}{6} \] D
16) \[ \int_{\ln 3}^{\ln 6} \frac{x + 1}{x^2 + 2x + 3} \, dx = \frac{1}{2} \left[ \ln |u| \right]_0^6 = \frac{1}{2} (\ln 18 - \ln 6) = \ln \sqrt{3} \]

17) A(t) = t + \cos(2t) \Rightarrow v(t) = t^2/2 + (\sin(2t))/2 + C_1 \Rightarrow C_1 = 0; x(t) = \frac{t^3}{6} - (\cos(2t))/4 + C_2 & C_2 = \frac{1}{4}; \text{ so } x(\pi) = \frac{\pi^3}{6} \]

18) \[ \int_0^{\pi/2} (e^x + \sin x) \, dx = \left[ \frac{\sin(x)}{2} - \cos(x/2) - (0 - 1) \right]_0^{\pi/2} = \pi/2 + 1 - \pi/2 \]

19) A = \int_{-2}^{1} \left[(3 - x^2) - (x + 1)\right] \, dx = 2 - 1/3 - 1/2 - (-6 + 8/3 - 2) = 9/2

20) Given \( g(x) = \int_1^t (t-4) \, dt \), \( g'(x) = (2x^2 - 4) \Rightarrow x = \pm \sqrt{2/3} \) and \( g''(x) > 0 \) on \( (-\infty, -\sqrt{2/3}) \cup (\sqrt{2/3}, \infty) \)

21) Using l'Hopital's Rule, \( \lim_{x \to 1} \frac{2(t \ln t - t + e^{t-1} + \pi t)}{x^2 - 1} \Rightarrow \lim_{x \to 1} \frac{x \ln x - x + e^{x-1} + \pi x}{x} = \pi \)

22) \[ \int \frac{x}{(2x+d)^2} \, dx = \frac{1}{2} \int \frac{1}{(2x+d)} \, dx = \frac{1}{2} \left[ \frac{1}{(2x+d)^2} \right]_0^6 = \frac{1}{4} \ln |2x + d| + \frac{d}{4(2x + d)} + C \]

23) TD = \int_0^3 |4t^3| \, dt = -\int_{-2}^0 4t^3 \, dt + \int_0^3 4t^3 \, dt = 16 + 81 = 97

24) Since \( f^{-1}(x) = e^{x/\pi} \), then \( \int f^{-1}(x) \, dx = \int \frac{e^{x}}{\pi} \, dx = e^{x/\pi} + C \)

25) A = \int_0^4 (4 - x^2) \, dx = 16/3; \text{ so } A/2 = 8/3 \Rightarrow 8/3 = \frac{4}{c} \Rightarrow c = \frac{\sqrt{16}}{3}

26) V = \frac{1}{2} \int_0^1 [(1-x^4) - (1-x^2)]^2 \, dx = \frac{1}{2} \int_0^1 (x^2 - x^4)^2 \, dx

27) \[ \int \sin^3 x \cos^4 x \, dx = \int \sin x \cos^4 x \, dx - \int \sin x \cos^2 x \, dx = (\sec^3 x)/3 - \sec x + C \]

28) SA = 2\pi \int_0^3 \frac{t^3}{\sqrt{1 + (3t^2)^2}} \, dt = \frac{\pi^{10}}{18} \int_3^{10} \frac{t^3}{\sqrt{u}} \, du = \frac{\pi(10^{3/2} - 1)}{27}

29) \( \int_{-100}^{100} (v + \sin v + v \cos v + \sin^3 v) \, dv = 0 \) (odd integrand with limits of -a to a \( \Rightarrow 0 \))
30) \( \int_{0}^{1/2} \frac{1}{1 - x^2} \, dx = \tanh^{-1} x \bigg|_{0}^{1/2} = \frac{1}{2} \left[ \ln \left| \frac{1 + x}{1 - x} \right| \right]_{0}^{1/2} = \ln \sqrt{3} \quad C \)