1997

2. $\frac{dy}{dt} = 2\cos(2t)$ $\quad \frac{dx}{dt} = 2e^{2t}$ $\quad \frac{\cos(2t)}{e^{2t}}$ (E)

11. $\lim_{b\to\infty} \frac{1}{2}\int_1^b \frac{1}{u^2}\,du = -\frac{1}{2u}\Big|_1^b = \frac{-1}{2(1+x^2)}\Big|_1^b =$

$u = 1+x^2$ $\quad du = 2x\,dx$ $\quad \frac{1}{2}du = x\,dx$

$\lim_{b\to\infty} \frac{-1}{2(1+b^2)} + \frac{1}{4} = \boxed{\frac{1}{4}}$ (C)

(C)

14. $r = \frac{\frac{9}{16}}{\frac{3}{2}} = \frac{18}{48} = \frac{3}{8}$ $\quad S = \frac{\frac{3}{2}}{1-\frac{3}{8}} = \frac{\frac{3}{2}}{\frac{5}{8}}\Big] = \frac{24}{10} = \boxed{\frac{12}{5}}$

15. $\frac{dx}{dt} = -3\cos^2 t\sin t$ $\quad \frac{dy}{dt} = 3\sin^2 t\cos t$ (D)

$$\int_0^{\pi/2} \sqrt{(-3\cos^2 t\sin t)^2 + (3\sin^2 t\cos t)^2}\,dt$$

16. $\lim_{h\to 0} \frac{e^0 - 1}{2(0)} = \frac{0}{0} = \frac{e^h}{2} = \frac{e^0}{2} = \frac{1}{2}$ (B)

17. $f(x) = \ln(3-x)$ $\quad f(2) = 0$

$f'(x) = \frac{-1}{3-x}$ $\quad f'(2) = -1$

$f''(x) = \frac{-1}{(3-x)^2}$ $\quad f''(2) = -1$

$f'''(x) = \frac{-2}{(3-x)^3}$ $\quad f'''(2) = -2$

$\frac{0x^0}{0!} - \frac{(x-2)^1}{1!} - \frac{(x-2)^2}{2!} - \frac{2(x-2)^3}{3!}$

$= (x-2) - \frac{(x-2)^2}{2} - \frac{(x-2)^3}{3}$

(B)

18. $\frac{dx}{dt} = 3t^2 - 2t = 0$

$t = 0 \quad 3t = 2$

$t = 2/3$

(C)

20. $\lim_{n\to\infty} \left| \frac{(x-2)^{n+1}}{(n+1)3^{(n+1)}} \cdot \frac{n!\cdot 3^n}{(x-2)^n} \right| = \left| \frac{(x-2)\,n}{3(n+1)} \right| = \left| \frac{x-2}{3} \right| < 1$

(E) $|x-2|<3 \quad x<5 \cap x>-1 \quad \boxed{-1<x<5}$

$\sqrt{x=-1} \sum_{n=1}^{\infty} \frac{(-3)^n}{n\cdot 3^n} = \frac{-1^n}{n}$ CONV $\sqrt{x=5} \sum \frac{3^n}{n\cdot 3^n} = \frac{1}{n}$ X

24. $f'(x) = x^2 - \frac{(x^2)^3}{3!} + \frac{(x^2)^5}{5!} + \dots = x^2 - \frac{x^6}{6} + \frac{x^{10}}{120} + \dots$

$f(x) = \int x^2 - \frac{x^6}{6} + \frac{x^{10}}{120} + \dots = \frac{x^3}{3} - \boxed{\frac{x^7}{6\cdot 7}} + \frac{x^{11}}{(120)\cdot 11}$

(D)

76. I. lim $= \frac{5}{2}$ CONV. II lim $= \infty$ n°FEPL III. 1 CONV. (D)

84. $\int u\,dv = \quad u = x^2 \quad dv = \sin x\,dx$

$du = 2x\,dx \quad v = -\cos x$ (C)

u	dv	±
x^2	$\sin x$	+
$2x$	$-\cos x$	−
2	$-\sin x$	+
0	$\cos x$	−

$-x^2\cos x + 2x\sin x + 2\cos x + c$

86. $1 = \frac{A}{x-1} + \frac{B}{x+3} \qquad 1 = A(x+3) = B(x-1)$

$x=1 \quad 1 = 4A \quad \boxed{A = 1/4} \qquad x=-3 \quad 1 = -4B \quad \boxed{B = -1/4}$

$\frac{1}{4}\int \frac{1}{x-1}dx - \frac{1}{4}\int \frac{1}{x+3}dx = \frac{1}{4}\ln|x-1| - \frac{1}{4}\ln|x+3| + C$

$\frac{1}{4}\ln\left|\frac{x-1}{x+3}\right| + C$ (A)

1998

2. $\dfrac{\frac{dy}{dx}}{\frac{dx}{dt}} = \dfrac{3}{5}$ (A)

4. $\int \dfrac{1}{(x-4)(x-2)}\,dx = \dfrac{A}{x-4} + \dfrac{B}{x-2}$

$x=4 \quad 1 = A(x-2) + B(x-4)$ $\qquad x=2 \quad 1 = -2A$

$1 = 2A \quad \boxed{A = 1/2}$ $\qquad \boxed{B = -1/2}$

$\frac{1}{2}\int \frac{1}{x-4}\,dx - \frac{1}{2}\int \frac{1}{x-2}\,dx = \frac{1}{2}\ln|x-4| - \frac{1}{2}\ln|x-2| + C$

$= \frac{1}{2}\ln\left|\frac{x-4}{x-2}\right| + C$ (A)

14. $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots \qquad 1 - \frac{1}{6} + \frac{1}{120}$ (E)

15.

u	dv	±
x	cosx	+
1	sinx	−
0	−cosx	+

$x\sin x + \cos x + C$ (B)

18. I. n^{TH} TERM - DIV II. ALT - CONV III. HARMONIC - DIV

(B)

21. $\int \sqrt{(t^2)^2 + (t)^2}\,dt = \int \sqrt{t^4 + t^2}\,dt$ (C)

22. (A) INTEGRAL TEST

25. $\lim_{b\to\infty} -\frac{1}{3}\int_0^b e^u\,du = -\frac{1}{3}e^{-x^3}\Big|_0^b = \frac{-1}{3e^{b^3}} + \frac{1}{3e^0}$

$0 + \frac{1}{3}$ (C)

$u = -x^3$

27. $a_n \cdot nx^{n-1} = na_n$ (D)

28. L'HOPS $\frac{e^{x^2}}{2x} = \frac{e^1}{2} = \frac{e}{2}$ (C)

76. (D) $3 < 4$ & 3 ODD

77. $f'(t) = (-e^{-t}, -\sin t)$
$f''(t) = (e^{-t}, -\cos t)$ (E)

83. $f(x) = (x-1) - \frac{(x-1)^2}{2} + \frac{(x-1)^3}{3}$ (C) CALC

84. $\lim_{n\to\infty} \left| \frac{(x+2)^{n+1}}{\sqrt{n+1}} \cdot \frac{\sqrt{n}}{(x+2)^n} \right| = \left| \frac{(x+2)\sqrt{n}}{\sqrt{n+1}} \right| = |x+2| < 1$
$x < -1 \wedge x > -3$

$x = 1 \quad \frac{1^n}{\sqrt{n}}$ $\qquad x = (-1)^n \quad \frac{}{\sqrt{n}}$

$-3 \le x < -1$ (B)

92. $f'(x) = 2x - 2 \quad f'(2) = 2 \qquad (2,3) \quad m = 2$
$f(2) = 4 - 4 + 3 = 3 \qquad 3 = 2(2) + b \quad b = -1$
$y = 2x - 1$

$y = 2x - 1 \qquad f(x) = x^2 - 2x + 3$
$2(2.8) - 1 \qquad = (2.8)^2 - 2(2.8) + 3$
$= 4.6 \qquad := 5.24$

2003

Error = .64

77. $\frac{f'''(0)}{3!} = -5 \quad f'''(0) = -5(6) = -30$ (A)

84. $|v| = \sqrt{(2t)^2 + (4\cos(4t))^2} = \sqrt{36 + 16\cos^2(12)} \approx 6.88$

(C)

2. L'HOP $\frac{e^x + \sin x - 2}{2x - 2} = \frac{1 + 0 - 2}{-2} = \frac{-1}{-2} = \frac{1}{2}$ (C)

4. $\frac{dy}{dx} = \frac{4\cos t}{-3\sin t} = \frac{4\cos(13)}{-3\sin(13)} = -\frac{4}{3}\cot(13) = \frac{-4}{3\tan(13)}$ (D)

6. P must $B > 1$ $\therefore P > 1/2$ (C)

7. $\frac{dx}{dt} = 3t^2 - 6t = 0$ $\quad \frac{dy}{dt} = 6t^2 - 6t - 12 = 0$

$3t(t-2) = 0$ $\quad 6(t^2 - t - 2) = 0$

$t = 0, (t = 2)$ $\quad 6(t-2)(t+1) = 0$

(C) $\quad (t = 2), t = -1$

10. $\sum_{1}^{\infty} 2\left(\frac{2}{3}\right)^n \quad S = \frac{\frac{4}{3}}{1-\left(\frac{2}{3}\right)} = \frac{\frac{4}{3}}{\frac{1}{3}} = 4$ (C)

11. $\frac{1}{1-x} = 1 + x + x^2 + x^3 + \cdots$

$\frac{1}{1-x^2} = 1 + x^2 + x^4 + x^6 + \cdots$ (D)

$\frac{x^2}{1-x^2} = x^2 + x^4 + x^6 + x^8 + \cdots$

15. $\frac{dy}{dx} = 3x^2 \quad y = x^3 + c \quad 6 = 1 + c \quad c = 5$ (B)

17. $\frac{dy}{dx} = \frac{3t^2}{2t-4} = \frac{12}{0} \quad t = 2$ UND $\therefore x = -3$ (A)

20. $\frac{x^n}{n!} = e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots$ (D)

$x^2 e^x = x^2 + x^3 + \frac{x^4}{2!} + \cdots - x^3 - x^2$

22. (E) $\frac{1}{n^{p-1}} \quad p > 2$

1-CT

23.

u	dv	±
x	$\sin(6x)$	+
1	$-\frac{1}{6}\cos(6x)$	−
0	$-\frac{1}{36}\sin(6x)$	+

$$-\frac{x}{6}\cos(6x)+\frac{1}{36}\sin(6x)+C$$

(B)

24. I. CONV. Geom $r<1$ — II. DIV p-series $p<1$ — III. n^{TH} TERM = 1 DIV

(D)

26. $$2x=\frac{A}{(x+2)}+\frac{B}{(x+1)} \qquad 2x=A(x+1)+B(x+2)$$

$x=-1$: $-2=B$ $\quad$ $x=2$: $4=3A$ $\quad A=4$

$$\int\frac{4}{x+2}dx-\int\frac{2}{x+1}dx$$

$$4\ln|x+2|-2\ln|x+1|+C$$

(D)

28. $f(x)=(1+x)^{-2}$ @ $x=0$ $=1$

$f'(x)=-2(1+x)^{-3}$ $=-2$

$f''(x)=6(1+x)^{-4}$ $=6$

$$\frac{1x^0}{0!}-\frac{2x^1}{1!}+\frac{6x^2}{2!}=3$$

(D)