$\int e^u\,du$

1997 AP Calc AB part A (no calculator)

1) $\int_1^2 (4x^3-6x)\,dx$

$\frac{4x^4}{4}-\frac{6x^2}{2}\Big|_1^2$

$x^4-3x^2\Big|_1^2$

$(16-12)-(1-3)=$

$4-(-2)=\boxed{6}$ C

2) $f(x)=x\sqrt{2x-3}$

$f'(x)=x\left(\frac{1}{2}\right)(2x-3)^{-1/2}(2)+(2x-3)^{1/2}$

$f'(x)=\frac{x}{\sqrt{2x-3}}+\sqrt{2x-3}$

$=\boxed{\frac{3x-3}{\sqrt{2x-3}}}$ A

3) $\int_a^b f(x)\,dx=a+2b$

$\int_a^b f(x)+\int_a^b 5=$ $5x$

$a+2b+5b-5a=$

$\boxed{-4a+7b}$ C

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

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

$f'(-1)=-3+1-1=\boxed{-3}$ D

5) $y=3x^4-16x^3+24x^2+48$

$y'=12x^3-48x^2+48x$

$y''=36x^2-96x+48=0$

$6(6x^2-16x+8)=0$

$12(3x^2-8x+4)=0$

$12(3x-2)(x-2)=0$

$x=+2/3,+2$ $\xleftarrow{\;+\;\;2/3\;\;-\;\;2\;\;+\;}$ E $\left(\frac{2}{3}<x<2\right)$

6) $\frac{1}{2}\int e^{\frac{1}{2}t}\,dt$ $\quad u=\frac{1}{2}t \quad du=\frac{1}{2}dt$

$\int e^u\,du=\boxed{e^{1/2t}+C}$ C

7) $\frac{d}{dx}[\cos(x^3)]^2=$

$=2\cos(x^3)(-\sin(x^3))(3x^2)$

$=\boxed{-6x^2\sin(x^3)(\cos(x^3))}$ D

8) changes direction when $v=0$, or $\boxed{t=6}$ C

9) total distance from $t=0$ to $t=8$

$\int_0^6+\int_6^8=\frac{1}{2}(3)(2+6)+\frac{1}{2}(2)(1)$

$\frac{1}{2}h(b_1+b_2)+\frac{1}{2}bh$

$=12+1=\boxed{13}$ B

10) $y=\cos(2x)$ $\quad x=\pi/4 \quad y=0$

$y'=-\sin(2x)(2)$

$y'=-2\sin 2x$

$y'(\pi/4)=-2\sin(2\cdot\pi/4)=-2$

$\boxed{y=-2(x-\pi/4)}$ E

11) E

12) $2x-4y=3$

$-4y=-2x+3$

$y=\frac{1}{2}x-\frac{3}{4}$ $\quad m=1/2$

$y=\frac{1}{2}x^2$

$y'=x \quad x=\frac{1}{2} \quad y=\frac{1}{8}$

$\boxed{(1/2,\ 1/8)}$ B

13) $f'(x) = \frac{|4-x^2|}{x-2}$ top positive

$x=2$ $\xleftarrow{\;-\;\;|_2\;\;+\;}$

f dec. where $f'<2$

$\boxed{(-\infty,2)}$ A

14) $f(3)=2$ $(3,2)$

$f'(3)=5$ $m=5$

$y-2=5(x-3)$

$y=5x-13=0$

$x=13/5 \approx \boxed{2.6}$ C

15) B

16) $y=x^2+1$ $y=5$

$x^2+1=5$ $x^2=4$

$x=\pm 2$

$\int_{-2}^{2}[5-(x^2+1)]dx$

$\int 5-x^2-1$

$\int_{-2}^{2}(4-x^2)dx$

$4x-\frac{x^3}{3}\Big|_{-2}^{2} = (8-\frac{8}{3})-(-8+\frac{8}{3})$ D

$\frac{16}{3}-(\frac{-16}{3}) = \boxed{\frac{32}{3}}$

17) $x^2+y^2=25$ $(4,3)$

$2x+2y\frac{dy}{dx}=0$

$2y\frac{dy}{dx}=-2x$ $\frac{dy}{dx}=\frac{-x}{y}=\frac{-4}{3}$

$\frac{d^2y}{dx^2}=\frac{y(-1)-(-x)\frac{dy}{dx}}{y^2}$

$\frac{-3+4\frac{dy}{dx}}{9} = \frac{-3+4(\frac{-4}{3})}{9}$

$=\frac{-3-\frac{16}{3}}{9} = \frac{\frac{-25}{3}}{9}$

$=\frac{-25}{3}\cdot\frac{1}{9}=\boxed{\frac{-25}{27}}$ A

18) $\int_0^{\pi/4}\frac{e^{\tan x}}{\cos^2 x}dx$ $u=\tan x$, $du=\sec^2 x\,dx$, $\frac{1}{\cos^2 x}$

$\int_0^{\pi/4} e^u du = e^{\tan x}\Big|_0^{\pi/4}$

$e^{\tan \pi/4}-e^{\tan 0} = e^1-e^0=\boxed{e-1}$ C

19) $f(x)=\ln|x^2-1|$

$f'(x)=\boxed{\frac{2x}{x^2-1}}$ D

20) $\frac{1}{5-(-3)}\int_{-3}^{5}\cos x\,dx = \frac{1}{8}\sin x\Big|_{-3}^{5}$

$\frac{1}{8}(\sin 5-\sin(-3))$ $\sin -x = -\sin x$

$\boxed{\frac{1}{8}(\sin 5+\sin 3)}$ E

21) $\lim_{x\to 1}\frac{x}{\ln x}=\frac{1}{0}$

$\lim_{x\to 1^+}=\frac{+}{+}$ $\lim_{x\to 1^-}=\frac{+}{-}$ $\boxed{\text{DNE}}$ E

22) $f(x)=(x^2-3)e^{-x}$

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

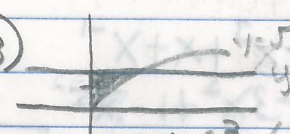
$-e^{-x}(x^2-3-2x)=0$

$-e^{-x}(x^2-2x-3)=0$

$-e^{-x}(x-3)(x+1)=0$

$x=3,-1$ $\xleftarrow{\;-\;|_{-1}\;+\;|_{3}\;-\;}$

D $\boxed{(-1,3)}$

23) 

$x=y^2$

$\pi\int_0^2(y^2-0)^2dy$

$\pi\int_0^2 y^4dy=\pi\frac{y^5}{5}\Big|_0^2$

$\boxed{\frac{32\pi}{5}}$ A

? 24) $[0,1]$ 50 subdivisions $\Delta x=\frac{1}{50}$

$\frac{1}{50},\frac{2}{50},\frac{3}{50}\ldots$

$\frac{1}{1-0}$ $f(x)=\sqrt{x}$

25) removed from AB in 1998 - (BC only)

1997 AP Calculus AP Part B (calculator)

76) $f(x) = \frac{e^{2x}}{2x}$

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

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

$\boxed{f'(x) = \frac{e^{2x}(2x-1)}{2x^2}}$ E

77) $y = x^3 + 6x^2 + 7x - 2\cos x$

$y' = 3x^2 + 12x + 7 + 2\sin x$

$y'' = 6x + 12 + 2\cos x$

$x = -1.89$ $\boxed{D}$

78) $F(3) - F(1) = \int_0^3 f(x)\,dx = \int_0^1 f(x) + \int_1^3 f(x)$

$2 + 2.3 = \boxed{4.3}$ D

79) $\lim_{h\to 0} \frac{f(2+h) - f(2)}{h} = 5$ continuous at 2, diff at 2 $\boxed{\text{I II}}$ C

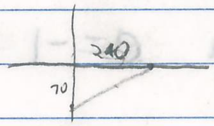
$f'(2) = 5$ dont know anything about f'

80) $f(x) = 2e^{4x^2}$

$f'(x) = 2e^{4x^2}(8x)$

$f'(x) = 16xe^{4x^2} = 3$

$\boxed{x = .168}$ A

81) 

$\frac{dx}{dt} = 60$ $t = 4$ seconds

$y = 70$ $\frac{dy}{dt} = ?$ $x = 60 \cdot 4 = 240$

$x^2 + y^2 = r^2$

$x^2 + 70^2 = r^2$

$2x \frac{dx}{dt} = 2r \frac{dr}{dt}$

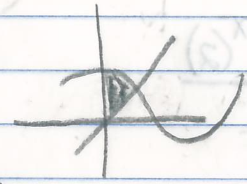
$240 \qquad 2(250)$

$480(60) = 500 \frac{dr}{dt}$

$\boxed{dr/dt = 57.6}$ A

* 82) Skip $y = 2x - 8$ min of xy

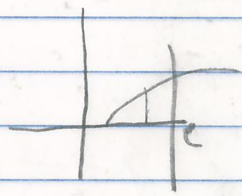
83) $y = \cos x \quad y = x$



$\int_0^{.739} (\cos x - x)\,dx$

$\boxed{.400}$ C

BC 84)



$A = (\sqrt{\ln x} - 0)^2$

$\int_1^e (\sqrt{\ln x})^2\,dx = \int_1^e \ln x$

$x\ln x - x \Big|_1^e = (e\ln e - e) - (1\ln 1 - 1) = 0 + 1 = \boxed{1}$ C

85) $f'(x) = e^x - 3x^2$ changes from pos to neg at $\boxed{x = .91}$ C

86) $f(x) = \sqrt{x}$

$f'(x) = \frac{1}{2}x^{-1/2} \qquad f'(c) = 2f'(1)$

$\frac{1}{2}c^{-1/2} = 2\left(\frac{1}{2}\right) \qquad c^{-1/2} = 2$

$\frac{1}{\sqrt{c}} = 2 \qquad 2\sqrt{c} = 1 \qquad \sqrt{c} = 1/2 \quad \boxed{c = 1/4}$ A

87) $a(t) = t + \sin t$ $\qquad t=0 \quad vel = -2$

$v(t) = \int t + \sin t = \frac{t^2}{2} - \cos t + C$

$0 - \cos(0) + C = -2 \qquad C = -1$

$v(t) = \frac{t^2}{2} - \cos t - 1 = 0$

$\boxed{t = 1.48}$ B