1. $x+y=72 \Rightarrow x=72-y$

$\boxed{C}$ $xy^3 = \max$

$(72-y)y^3 = \max$

$72y^3 - y^4 = \max$

$216y^2 - 4y^3 = 0$

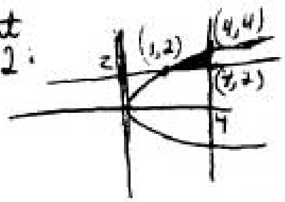
$4y^2(54-y)=0$

$\Rightarrow y=54,\ x=18$

product $= \underline{972}$

2. about $y=2$:

$\boxed{D}$



$V=\pi\int r^2\,dx = \pi\int_1^4 (y-2)^2\,dx$

$=\pi\int_1^4 (y^2-4y+4)\,dx = \pi\int_1^4 (4x-8\sqrt{x}+4)\,dx$

$= \underline{\frac{14\pi}{3}}$

3. about $x=4$: ($\boxed{D}$)

$V=2\pi\int_1^4(4-x)(\sqrt{2x}-2)\,dx = \underline{\frac{106\pi}{15}}$

(or $V=\pi\int_2^4(4-x)^2\,dy \Rightarrow \pi\int_2^4\left(4-\frac{1}{4}y^2\right)^2 dy = \underline{\frac{106\pi}{15}}$)

4. $SA = 2\pi\int_2^4 y\sqrt{1+\left(\frac{dx}{dy}\right)^2}\,dy$

$\boxed{C}$ $= 2\pi\int_2^4 y\sqrt{1+\left(\frac{y}{2}\right)^2}\,dy \approx \underline{69.969}$

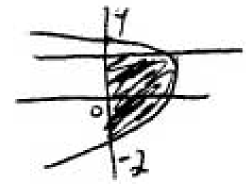
5. $AL = \int_0^4\sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$, $y=x^{\frac{3}{2}} \Rightarrow \frac{dy}{dx}=\frac{3}{2}x^{\frac{1}{2}}$

$\boxed{A}$ $AL = \int_0^4\sqrt{1+\frac{9}{4}x}\,dx = \underline{\frac{8}{27}\left(10^{\frac{3}{2}}-1\right)}$

6. $y=\frac{4x^2-4x}{x^2-1} = \frac{4x(\cancel{x-1})}{(\cancel{x-1})(x+1)} = \frac{4x}{x+1}$

$\boxed{B}$ $\Rightarrow$ 1 vert, 1 horizontal $\Rightarrow \underline{2}$

7. $\boxed{D}$



$A=\int_{-2}^{3}\left[(8+2y-y^2)-0\right]dy$

$= \underline{\frac{100}{3}}$

8. $a=-32\ \text{ft/s}^2$

$\boxed{D}$ $v(t) = at+v(0) \Rightarrow -32t+v(0) \Rightarrow -32$

$s(t) = -16t^2+s(0) \Rightarrow -16t^2+120$

$-16t^2+120=0 \Rightarrow t = \underline{\frac{\sqrt{30}}{2}}$

9. $\frac{dy}{dx}=\frac{1}{x^2}$

$\boxed{D}$ $\int dy = \int\frac{dx}{x^2} \Rightarrow y = -\frac{1}{x}+C$

$4 = -\frac{1}{2}+C \Rightarrow C=\frac{9}{2}$

$2 = -\frac{1}{x}+\frac{9}{2} \Rightarrow x = \underline{0.4}$

10. $P=\int_1^{\sqrt{3}}\frac{1}{\pi(1+x^2)}\,dx = \frac{1}{\pi}\tan^{-1}x\Big]_1^{\sqrt{3}}$

$\boxed{A}$ $= \underline{\frac{1}{12}}$

11. $P=W'=16t-2 \Rightarrow 16(2)-2 = \underline{30}$

$\boxed{C}$

12. $\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$, $\frac{d^2y}{dx^2} = \frac{\frac{d}{dt}\left(\frac{dy}{dx}\right)}{\frac{dx}{dt}}$

$\boxed{A}$

$\frac{dy}{dt} = \frac{(1+t^2)(-2t)-(1-t^2)(2t)}{(1+t^2)^2} = \frac{-4t}{(1+t^2)}$

$\frac{dx}{dt} = \frac{(1+t^2)(2)-(2t)(2t)}{(1+t^2)^2} = \frac{2-2t^2}{(1+t^2)^2}$

$\frac{d^2y}{dx^2} = \frac{-t^2-1}{(1-t^2)^2} \Rightarrow t=\frac{1}{2} \Rightarrow -\frac{1}{2}$

13. $f(x) = xe^{-x^2}$

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

$f''(x) = 4x^3e^{-x^2} - 4xe^{-x^2} - 2xe^{-x^2} = 0$

$\Rightarrow 4x^3 - 6x = 0 \Rightarrow 2x(2x^2 - 3) = 0$

$- \mid + \mid - \mid +$; $-\sqrt{\frac{3}{2}}$, 0, $\sqrt{\frac{3}{2}}$ $\Rightarrow$ 3 P.o.I.

14. $P(x) = R(x) - C(x)$

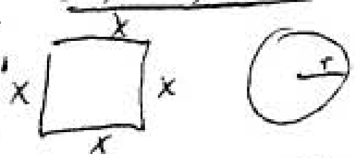
$\boxed{C}$ $= 4.8x - .0008x^2$

$P'(x) = 4.8 - .0016x > 0$

$\Rightarrow x > 3{,}000$

$(3{,}000, 6{,}000)$

15. $\boxed{B}$



$4x + 2\pi r = 16 \Rightarrow x = 4 - \frac{\pi}{2}r$

$x^2 + \pi r^2 = \max$

$16 - 4\pi r + \frac{\pi^2}{4}r^2 + \pi r^2 = \max$

$-4\pi + \frac{\pi^2}{2}r + 2\pi r = 0$

$\Rightarrow r = \frac{8}{4+\pi} \Rightarrow x = \frac{16}{4+\pi}$

$x^2 + \pi r^2 = \frac{64}{4+\pi}$

16. $C(x) = 800 + .04x + .0002x^2$

$\boxed{D}$ $\bar{C}(x) = \frac{C(x)}{x} = \frac{800}{x} + .04 + .0002x$

$\bar{C}'(x) = -\frac{800}{x^2} + .0002 = 0 \Rightarrow x = 2000$

$- \mid +$; 0, 2000

17. $a = 0,\ b = 1,\ n = 4$

$\boxed{B}$ $h = \frac{b-a}{n} = \frac{1}{4}$

$A \approx \frac{b-a}{2n}\left[f(a) + 2f(a+h) + 2f(a+2h) + \ldots\right.$

$= \frac{1}{8}\left[f(0) + 2f(\tfrac{1}{4}) + 2f(\tfrac{1}{2}) + 2f(\tfrac{3}{4}) \ldots\right.$

$= 1.172$

18. $AV = \frac{1}{2-1}\int_1^2 (1 + 1.6t\ln t)\,dt =$

$\boxed{E}$ $u = \ln t \quad dv = t$

$du = \frac{1}{t} \quad v = \frac{t^2}{2}$

$t + 1.6\left[\frac{t^2}{2}\ln t - \int \frac{t}{2}\,dt\right.$

$= 3.2\ln 2 - 0.2$

19. $d_1 = 4\text{ft} \Rightarrow r_1 = 2\text{ft} = 24\text{ in}$

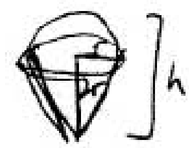
$\boxed{A}$ $d_2 = 4\text{ft}, 2\text{in} \Rightarrow r_2 = 2\text{ft}, 1\text{in} = 25\text{ in}$

$A = \frac{4}{3}\pi r_2^3 - \frac{4}{3}\pi r_1^3 = \frac{4}{3}\pi(25^3 - 2$

$B = dv = 4\pi r^2\,dr = 4\pi(24)^2(1) =$

$|A - B| = 305$

20. $\boxed{B}$

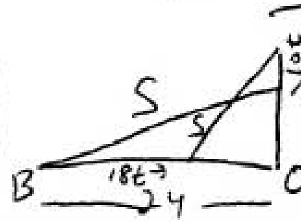


$h = 3r$

$V = \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2(2r) = \frac{4}{81}\pi h^3$

$\Rightarrow \frac{dv}{dh} = \frac{4\pi h^2}{27}$

21. $\boxed{E}$



at time t, B is $24 - 18t$ and A is $12 + 10t$

$\Rightarrow S = \sqrt{(24-18t)^2 + (12+10t)^2}$

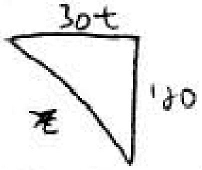
$= \sqrt{720 - 624t + 424t^2}$

$\frac{ds}{dt} = \frac{-312+424t}{\sqrt{720-624t+424t^2}} = 0$ at $t=0$, $\frac{ds}{dt} < 0$, so $\exists t \ni \frac{ds}{dt}=0$

$\Rightarrow t = \frac{312}{424}$

so B has traveled $\frac{312}{424}\cdot 18 \approx \underline{13.2}$

22. $\boxed{A}$



$900t^2+120^2=z^2$

$900t = zz'$

$z' = \frac{900t}{z}$

$\Rightarrow z' = \frac{30\sqrt{z^2-(120)^2}}{z}$ at $z=150$

$\Rightarrow 18$ ft/min $= \underline{\frac{3}{10}}$ ft/s

23. $y''=y' \Rightarrow 6x-12 = 3x^2-12x+3$

$\boxed{C}$ $\Rightarrow 3x^2-18x+15=0$

$\Rightarrow x=5,\ 1$

$(5,-5),(1,3) \Rightarrow -5+3=\underline{-2}$

24. R_0 is constant, so

$\boxed{B}$ $\frac{dR}{dt} = R_0 a + R_0 b \frac{1}{3} T^{-\frac{2}{3}}$

$= R_0\left(a+\frac{b\sqrt[3]{T}}{3T}\right)$

25. $y=ax^2+bx+c$

$\boxed{E}$ $y'=2ax+b=4$ @ $x=-1$

$\Rightarrow -2a+b=4$

$2a(2)+b=0 \Rightarrow 4a=-b$

$\Rightarrow a=-\frac{2}{3},\ b=\frac{8}{3},\ c=\frac{1}{3}$

$a+b+c=\underline{\frac{7}{3}}$

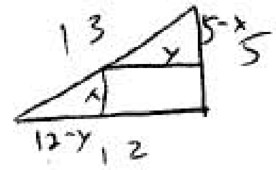
26. $C=(30+x)(400-10x)$

$\boxed{C}$ $C=-10x^2+100x+12000$

$C'=-20x+100=0$

$\Rightarrow x=5 \Rightarrow$ 35 apples

27. $\boxed{B}$



$\frac{x}{12-y}=\frac{5}{12}$

$12x=60-5y$

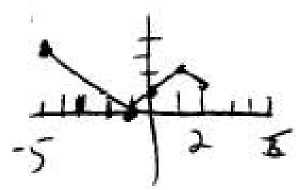
$A=xy$ $\quad x=5-\frac{5}{12}y$

$=\cancel{x}y(5-\frac{5}{12}y)=5y-\frac{5}{12}y^2$

$A'=5-\frac{5}{6}y=0 \Rightarrow y=6 \Rightarrow x=\frac{5}{2}$

$A=6(\frac{5}{2})=\underline{15}$

28. $\boxed{D}$



max = 4

min = 0

sum = $\underline{4}$

29. $F(x)=-kx^2$ (since attraction i in neg direc

$\boxed{D}$ $W=\int_4^2 f(x)\,dx=\int_4^2 -kx^2\,dx$

$=\underline{\frac{56}{3}k}$

30. $x^2+y^2=9 \Rightarrow 9-y^2=x^2$

vol of slice $= dV=\pi x^2\,dy$

$\boxed{B}$ weight of slice $=\pi w x^2\,dy$

$W=F(3+y) \Rightarrow dW=(3+y)dF=(3+y)w\pi$

$W=\int_0^3 \pi w x^2(3+y)\,dy=\int_0^3 \pi w(9-y^2)(3+y)\,d$

$=\underline{\frac{297}{4}w\pi}$