1. $\boxed{e < x < f}$ (also accept (e, f) or $[e, f]$ or $e \le x \le f$)

2. $\frac{1}{b-a}\int_a^b \text{acceleration}\cdot dt = \frac{1}{\frac{\pi}{3}-\frac{\pi}{4}}\int_{\frac{\pi}{4}}^{\pi/3} \text{accel} = \frac{12}{\pi}(\text{velocity})\Big|_{\frac{\pi}{4}}^{\pi/3}$

$\frac{12}{\pi}\left(\sec^2\frac{\pi}{3} - \sec^2\frac{\pi}{4}\right) = \frac{12}{\pi}(4-2) = \boxed{\frac{24}{\pi}}$

3. $\frac{dp}{dt} = kp$ at $t > 0$

Let 200 be $t=0$
and 400 be $t=2$
find p at $t=5$

$\frac{1}{p}dp = k\,dt$

$\ln p = kt + c$

$\ln 200 = 0 + c$

$\ln p = kt + \ln 200$

$\ln 400 = 2k + \ln 200$

$\ln 2 = 2k$

$\ln\sqrt{2} = k$

$\ln p = (\ln\sqrt{2})t + \ln 200$

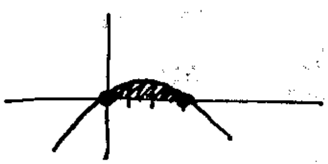
$\ln p = (\ln\sqrt{2})5 + \ln 200$

$p = 1131.37$
$= \boxed{1131}$

4. $\int x^2 e^x dx = x^2e^x - 2xe^x + 2e^x + c$

$f(x) = \boxed{x^2}$

5.



$\int_0^3 (3x - x^2)dx = 4.5$

width $= 3$

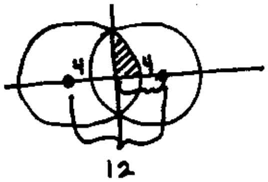
$3x = 4.5$

$x = 1.5 =$ height

Perimeter $= 3(2) + 1.5(2) = \boxed{9}$

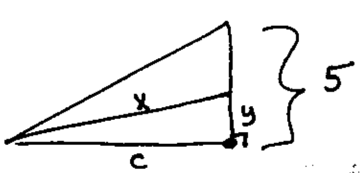
6. $4\int_0^2 (\text{left circle})dx = 4\int_0^2 \sqrt{64-(x+6)^2}\,dx$

$= \boxed{29.012}$ rounded



Suggestion: Find equation of left circle and enter as $y_1 = \sqrt{(64-(x+6)^2)}$ and then use integral capabilities of your calculator.

7.



$BC = 2(CD)$
$BC + CD = 5$
$3CD = 5$
$CD = 5/3,\ BC = 10/3$

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

$\cancel{2}\cdot\frac{5}{3}\cdot\frac{-1}{2} = \cancel{2}\cdot\frac{\sqrt{349}}{3}\cdot\frac{dx}{dt}$

$\frac{-5}{2} = \sqrt{349}\cdot\frac{dx}{dt}$

$x^2 = 6^2 + \frac{25}{9}$

$x = \sqrt{\frac{349}{3}}$

Answer $= \frac{5\sqrt{349}}{698}$

$\approx \boxed{.134}$

8. $\text{Arc} = \int_1^4 \sqrt{1 + \left[\frac{d}{dx} x^{2/3}\right]^2} = \int_1^4 \sqrt{1 + \left(\frac{2}{3} x^{-\frac{1}{3}}\right)^2}$

Answer ≈ 2.575[illegible]8

$\frac{1}{2}$ arc $= \sqrt{? + 49}$

Answer $= \boxed{10.142}$

9. $x^2 + y^2 = 9(\cos^2 t + \sin^2 t)$ Square & total

$x^2 + y^2 = 9$

$\boxed{\frac{dy}{dx} = -\frac{x}{y}}$

10. $y^2 dy = (x + 3x^2)\, dx$

$\frac{y^3}{3} = \frac{x^2}{2} + x^3 + c$

at $\left.\begin{matrix} y=6 \\ x=0 \end{matrix}\right\}$ $72 = c$

$\frac{y^3}{3} = \frac{x^2}{2} + x^3 + 72$

$y^3 = \frac{3}{2}x^2 + 3x^3 + 216$

$\boxed{y = \sqrt[3]{\frac{3}{2}x^2 + 3x^3 + 216}}$

11. $h'(x) = f'(g(x)) \cdot g'(x)$

$h'(1) = f'(g(1)) \cdot g'(1)$

$= f'(5) \cdot (-3)$

$= 3(-3) = \boxed{-9}$

12. $4x - 1 = A(x-2)^2 + B(x)(x-2) + C(x)$

$4x - 1 = \underline{Ax^2} - \underline{4Ax} + \underline{4A} + \underline{Bx^2} - \underline{2Bx} + \underline{Cx}$

$A + B = 0$

$-4A + -2B + C = 4$

$4A = -1$

$A = -\frac{1}{4}$

$\int_1^0 -\frac{1}{4}\, dx = -\frac{1}{4}x \Big|_1^0 = 0 + \frac{1}{4} = \boxed{\frac{1}{4}}$

13. $\int_1^x (\ln x - 3)\, dx =$

$x\ln x - x - 3x \Big|_1^x$

$x\ln x - x - 3x - (1\ln 1 - 1 - 3)$

$x\ln x - 4x + 4 = 4$

$x\ln x - 4x = 0$

$x(\ln x - 4) = 0$

$x = 0$ or $x = \boxed{e^4}$

not in domain

14. $\lim_{x \to \frac{\pi}{2}^-} (\tan x)^{\cos x} = k$

$\ln y = \cos x \cdot \ln \tan x = \frac{\ln \tan x}{\sec x}$

$\lim_{x \to \frac{\pi}{2}^-} \ln y = \lim_{x \to \frac{\pi}{2}^-} \frac{\ln \tan x}{\sec x}$

$= \lim_{x \to \frac{\pi}{2}^-} \frac{\frac{\sec^2 x}{\tan x}}{\sec x \cdot \tan x}$

$= \lim_{x \to \frac{\pi}{2}^-} \frac{\sec x}{\tan^2 x} = 0$

So $\lim_{x \to \frac{\pi}{2}^-} y = e^0 = 1$

$k = 1$ Answer $= \boxed{12}$

15. $y = \cos x - x$

$y_2 = .5 - \frac{\cos(.5) - .5}{-\sin(.5) - 1}$

$= .5 - -.255222$

$= \boxed{.755}$