1. $L = 2(3+1+4+2) = 20; R = 2(1+4+2+5) = 24; T = \frac{1}{2}\cdot 2\cdot(3+2+8+4+5) = 22$

$20 + 24 + 22 = \boxed{66}$

2. $\int_0^{1.71930} (4 - x^2 - \arctan(x))dx \approx 4.0758$ $\int_0^2 \left(4 - x^2\right)dx = \frac{16}{3} = R + S$

$S = \frac{16}{3} - R \approx 1.25753$ $R - S \approx \boxed{2.818}$

3. $f(3) = 9a + 3b + 2 = 0$ $9a + 3b = -2$

$2ax + b = f'(x)$ $6a + b = 2$

$f'(3) = 6a + b = 2$ $-18a - 3b = -6$ $b = -\frac{10}{3}$ $c = 2$ (the y-intercept)

$9\cdot\frac{8}{9} + 3b = -2$ $9a + 3b = -2$ $\frac{8}{9} - \frac{30}{9} + \frac{18}{9} = -\frac{4}{9}$

$3b = -10$ $-9a = -8$ $a = \frac{9}{8}$

4. $x^2 y = -8 + 4y^2;$ $x^2 3y^2 \frac{dy}{dt} + y^3 2x\frac{dx}{dt} = 8y\frac{dy}{dt};$

$12\frac{dy}{dt} + 8(-2)(2) = 16\frac{dy}{dt};$ $-32 = 4\frac{dy}{dt};$ $\frac{dy}{dt} = \boxed{-8}$

5. All are true. Speed is increasing because $v(1.9) < 0$ and $a(1.9) < 0$. $\int_0^2 |v(t)|dt \approx 2.955$ total distance traveled. $v''(1.9) > 0$ so v' is increasing. Graph velocity and see that it changes sign only one time on [0,2]. $\frac{\int_0^2 v(t)dt}{2} \approx 1.406$. $-3 + 5 - 8 + 7 + 4 - 7 = \boxed{-2}$

6. $A = 1.1;$ $y - 1 = .1 - 0;$ $y = 1.1;$ $C = \pi\int_0^1 e^{2\sin(x)}dx \approx 8.850$

6.

$B = \int_0^1 e^{\sin x}dx \approx 1.632$ $D \approx .345$ where $\frac{f(1) - f(0)}{1 - 0} = \cos x \cdot e^{\sin x}$; $x \approx .345$

A + B + C + D = 1.1 + 1.632 + 8.850 + 0.345 = $\boxed{11.927}$

7. $P = 3s;\quad \frac{dP}{dt} = 3\frac{ds}{dt};\quad 9 = 3\frac{ds}{dt};\quad \frac{ds}{dt} = 3 \qquad A = \frac{\sqrt{3}}{4}s^2;\quad \frac{dA}{dt} = \frac{\sqrt{3}}{2}s\frac{ds}{dt};\quad \frac{dA}{dt} = \frac{\sqrt{3}}{2}\cdot 6\cdot 3 = 9\sqrt{3}$

B = the x-coord of the minimum value of $\sqrt{x^2 + 9\left(\ln(x+2)\right)^2}$ which is -.88484 A + B = **14.704**

8. $3x^2 - 4x + 1 = 0$

$(3x-1)(x-1) = 0 \qquad (1,-1)$ and $\left(\frac{1}{3}, -\frac{23}{27}\right)$ the critical points.

$x = \frac{1}{3}$ or $x = 1$

$6x - 4 = 0$

$x = \frac{2}{3}$=B the x-coord of infl pt

$\sqrt{\left(1-\frac{1}{3}\right)^2 + \left(-\frac{23}{27}+1\right)^2} = \frac{2\sqrt{85}}{27} = A \qquad \frac{A}{B} = \frac{2\sqrt{85}}{27}\cdot\frac{3}{2} = \boxed{\frac{\sqrt{85}}{9}}$

9. $f(x) = 4x^2 - 12x + C;\quad 2x^2 - 3 + g(x) = 4x^2 - 12x + C_1;\quad g(x) = 2x^2 - 12x + C_2; g(0) = C_2; C_2 = 1$

$g(x) = 2x^2 - 12x + 1;\quad g(2) = 8 - 24 + 1;\quad g(2) = \boxed{-15}$

10. $\pi \int_0^{.668996} \left(\left(e^{-x} + 2\right)^2 - \left(\ln(x+1) + 2\right)^2\right)dx \approx 4.745$

11. $f(4) = \int_0^4 f'(t)dt + 2 = -4 + \frac{\pi}{2} + 2 = \frac{\pi}{2} - 2 = B$ Min $\qquad \frac{C}{B+2} + 2A = \frac{2\pi}{\frac{\pi}{2} - 2 + 2} + 5 = \boxed{9}$

$f(x) = \int_0^x f'(t)dt + 2;\quad f(-1) = \int_0^{-1} f'(t)dt + 2 = .5 + 2 = 2.5$ =A Max

$C = 2\pi$ (volume of cylinder with radius 1 and height 2)

12. $\frac{dy}{y} = \left(2x^2 - 2\right)dx;\quad \ln|y| = \frac{2}{3}x^3 - 2x + C;\quad \ln 3 = C$

$\ln|y| = \frac{2}{3}x^3 - 2x + \ln 3;\quad \ln y = \frac{16}{3} - 4 + \ln 3;\quad y = \boxed{3e^{\frac{4}{3}}}$

13. $y - 1 = -\frac{4}{x^2}(x-3);\quad \frac{4}{x} - 1 = -\frac{4}{x^2}(x-3);\quad 4x - x^2 = -4x + 12;$

$x^2 - 8x + 12 = 0;\quad (x-6)(x-2) = 0;\quad x = 6$ or $x = 2$

$y - 2 = -1(x-2) \quad b = 4$

$y - \frac{2}{3} = -\frac{1}{9}(x-6) \quad b = \frac{4}{3} \quad 4 + \frac{4}{3} = \boxed{\frac{16}{3}}$

14. $y = \int\sqrt{2x+1}\,dx = \frac{(2x+1)^{\frac{3}{2}}}{3} + C;\quad \frac{y(4) - y(0)}{4} = \frac{\frac{26}{3}}{4} = \boxed{\frac{13}{6}}$

15. $\int_0^p x^2 dx + 1 = \int_p^4 x^2 dx$; $\frac{1}{3}p^3 + 1 = \frac{64}{3} - \frac{p^3}{3}$; $\frac{2}{3}p^3 = \frac{61}{3}$; $p = \frac{\sqrt[3]{244}}{2}$