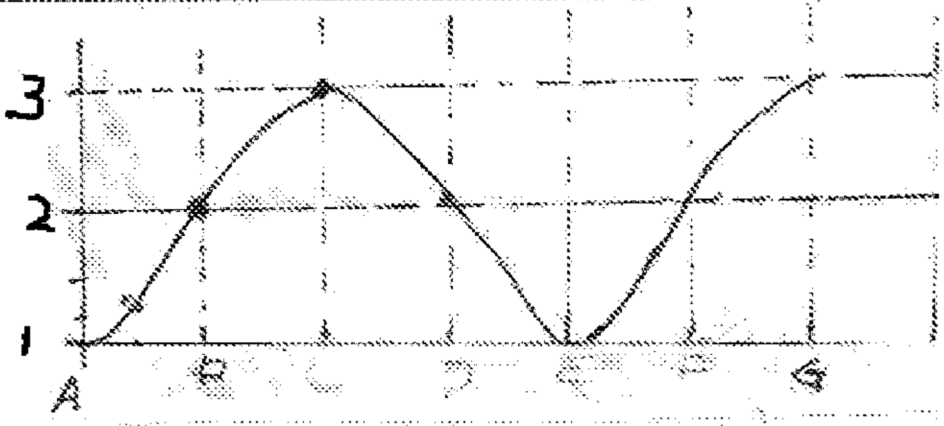
1



2 a $F'(x) = \boxed{\dfrac{1+2x+3x^2}{4x^3+5x^4+6x^5}}$

b $F'(x) = \sin(\ln(x))\,\ln'(x) = \boxed{\dfrac{1}{x}\sin(\ln(x))}$

c $\displaystyle\int_x^{x^2} z^2\,dz = \int_x^0 z^2\,dz + \int_0^{x^2} z^2\,dz = -\int_0^x z^2\,dz + \int_0^{x^2} z^2\,dz$

$= -x^2 + (x^4)(2x) = \boxed{2x^5 - x^2}.$

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3 a $\boxed{\begin{array}{l} u = x^2 \\ du = 2x\,dx \end{array}}$ $\displaystyle\int 2x e^{x^2}\,dx = \int e^u\,du = e^u + C = \boxed{e^{x^2} + C}$

b $\displaystyle\int \frac{[\ln x]^3}{x}\,dx = \int u^3\,du = \frac{u^4}{4} + C$ $\boxed{\begin{array}{l} u = \ln(x) \\ du = \frac{1}{x}\,dx \end{array}}$

$= \boxed{\dfrac{(\ln x)^4}{4} + C}.$

c $\boxed{\begin{array}{l} u = \sqrt{t} = t^{1/2} \\ du = \frac{1}{2}t^{-1/2}\,dt = \frac{1}{2\sqrt{t}}\,dt \end{array}}$ $\displaystyle\int_{t=0}^{\pi^2} \frac{\sin(\sqrt{t})}{2\sqrt{t}}\,dt = \int_{u=0}^{\pi} \sin(u)\,du$

$= -\cos(u)\Big|_{u=0}^{\pi} = -\cos(\pi) + \cos(0)$

$= 1 + 1$

$= \boxed{2}.$

(4) $\frac{dv}{dt} = -9.8$, $v(0) = 30$. Thus $v(t) = -9.8t + 30$

$\frac{ds}{dt} = -9.8t + 30$, so $s(t) = -4.9t^2 + 30t + s(0) = -4.9t^2 + 30t$.

The ball will hit the ground when $s = 0$, that is,

$-4.9t^2 + 30t = 0$. Factoring, we get

$t(-4.9t + 30) = 0$, giving $t = 0$ or $t = 30/4.9 \approx$ $\boxed{6.1 \text{ seconds}}$.