1. (a) The area represented by $\int_{-1}^{1} 2|x|dx$ consists of two right triangles above the x-axis with hight 2 and base 1. Therefore the integral is equal to $\boxed{2}$.

(b) Note that the graph of $y = \sqrt{4-x^2}$ is the first quadrant of the circle centred at $(0,0)$ and of radius 2. Therefore the graph of $\sqrt{4-x^2}+2$ is such a graph shifted up by 2, and the area represented by $\int_0^2 \left(\sqrt{4-x^2}+2\right)dx$ is equal to the area of the sector plus the area of a 2×2 square, that is $\boxed{\pi+4}$.

2.

$$
\begin{aligned}
(a) &\int_0^1 6x(1+x^2)dx \\
=&\int_0^1 6x+6x^3dx \\
=&\Big[6\frac{x^2}{2}+6\frac{x^4}{4}\Big]_0^1 \\
=&\Big[3x^2+3\frac{x^4}{2}\Big]_0^1 \\
=&3+\frac{3}{2} \\
=&\boxed{\frac{9}{2}}
\end{aligned}
$$

$$
\begin{aligned}
(b) &\int_1^4 \frac{\sqrt{x}-4}{x^2}dx \\
=&\int_1^4 \frac{\sqrt{x}}{x^2}-\frac{4}{x^2}dx \\
=&\int_1^4 x^{-3/2}-4x^{-2}dx \\
=&\Big[-2x^{-1/2}+4x^{-1}\Big]_1^4 \\
=&\Big[-\frac{2}{\sqrt{x}}+\frac{4}{x}\Big]_1^4 \\
=&(-1+1)-(-2+4) \\
=&\boxed{-2}
\end{aligned}
$$

3. (a) The displacement equals the integral of $v(t)$ over $[0,\pi]$, i.e.

$$\int_0^{\pi}(2\cos t-1)dt = [2\sin t - t]_0^{\pi} = \boxed{-\pi}$$

(b) The distance traveled equals the integral of $|v(t)|$ over $[0,\pi]$. Notice that $v(t)>0$ if $t<\pi/3$, and $v(t)<0$ if $t>\pi/3$. Therefore

$$\int_0^{\pi}|v(t)|dt = \int_0^{\pi/3} v(t)dt + \int_{\pi/3}^{\pi} -v(t)dt$$

where

$$\int_0^{\pi/3} v(t)dt = [2\sin t - t]_0^{\pi/3} = \sqrt{3} - \frac{\pi}{3}$$

and

$$\int_{\pi/3}^{\pi} v(t)dt = [2\sin t - t]_{\pi/3}^{\pi} = (0 - \pi) - (\sqrt{3} - \frac{\pi}{3}).$$

So

$$\int_0^{\pi} |v(t)|dt = 2(\sqrt{3} - \frac{\pi}{3}) + \pi = \boxed{2\sqrt{3} + \frac{\pi}{3}}$$