MATH H53 PRACTICE OF MIDTERM 1

The problems here may or may not reflect what we will have in the actual exam, these are just for practice.

1. Find the area enclosed by the curve $x = t^2 - 2t, y = \sqrt{t}$ and the y–axis.

2. First sketch the curve with polar equation $r = (1 + \cos\frac{\theta}{2})^2$, then compute the length of this curve.

3. Find a equation for the line through the point $(3, 4, 5)$ that is perpendicular to the line $x = 1 + t, y = 1 - 2t, z = 3t$ and intersects with this line.

4. For two vector–valued functions $\mathbf{r}_1(t) = \langle t^3 + 3t, t^2 + 1, 3t + 4\rangle$ and $\mathbf{r}_2(s) = \langle s, se^s, e^{s^2}\rangle$,
   (1) Find the equation of tangent line of $\mathbf{r}_1$ at $t = 1$ and the tangent line of $\mathbf{r}_2$ at $s = 0$.
   (2) Are these two lines intersect, parallel or skew?