Math 3202 **Due Tue Jan 24** **Assignment #1**

1. For each vector-function $\vec{r}(t) = (x(t), y(t))^T$, $t \in [a, b]$ given below (a-d)

   1. sketch $x(t)$ and $y(t)$

   2. sketch the curve in xy-plane, showing all details such as slope, asymptotes, vertices etc. Name the curve.

   3. find the velocity vector $\vec{v}(t)$ and speed $v(t)$;

   3a. Plot vector $v(0)$ for each curve on the same figure as the curve.

   4. find the acceleration vector $\vec{a}(t)$;

   6. set up the integral representing the length of the curve;

   7. find the curvature at $t = 0$

   (a) $x = 5\sin(2t)$, $y = 3\cos(2t)$, $0 \le t \le \pi/2$

   (b) $x = 5\tan(2t)$, $y = 3\sec(2t)$, $0 \le t \le \pi/8$

   (c) $x = t^3$, $y = 1 - t^3$, $0 \le t \le 1$

   (d) $x = 5t^9 + 1$, $y = 3t^3$, $0 \le t \le 1$

2. Find parametric equations for the sides of the trapezoid with vertices at points $(-1, 0)$, $(-1, 1)$, $(1, 1)$, $(2, 0)$.

3. Find velocity vector $\vec{v}(t)$ if

   (a) the acceleration vector is
   $$\vec{a}(t) = \frac{2t}{1+t^2}\mathbf{i} + \ln t\,\mathbf{j} + e^{-4t}\,\mathbf{k}$$

   (b) the position vector is
   $$\vec{r}(t) = \frac{2t}{1+t^2}\mathbf{i} + \ln t\,\mathbf{j} + e^{-4t}\,\mathbf{k}$$