

Math 203 — Calculus of vector-valued functions

Problem 1. Plot the curve given by $\mathbf{r}(t) = \langle t, t^3 \rangle$ for $-2 \leq t \leq 2$ and plot the tangent vectors $\mathbf{r}'(t)$ at times $t = -2, -1, 0, 1, 2$.

Problem 2. Plot the curve given by $\mathbf{r}(t) = \langle t^2, t \rangle$ for $-2 \leq t \leq 2$ and plot the tangent vectors $\mathbf{r}'(t)$ at times $t = -2, -1, 0, 1, 2$.

Problem 3. Find a vector equation for the tangent line to curve $\mathbf{r}(t)$ at the given t value.

a. $\mathbf{r}(t) = \langle 3t^3 - 2t^2 + t + 1, t^4 + t^3 - 3t \rangle, t = 1$

b. $\mathbf{r}(t) = \langle 3 \cos t, 3 \sin t, \frac{t}{2\pi} \rangle, t = \pi$

Problem 4. Compute $\mathbf{r}'(t)$ for the following functions.

a. $\mathbf{r}(t) = \langle \cos t, e^t, \ln t \rangle$

b. $\mathbf{r}(t) = \langle \sin(2t), e^{t^2}, \cos(t^3) \rangle$ (remember the chain rule)

c. $\mathbf{r}(t) = \langle t \cos t, t^2 \sin t, t^3 \ln t \rangle$ (remember the product rule)