

Индивидуальный тест №3 по курсу

«Дифференциальная геометрия и топология»

Натуральная параметризация регулярной кривой

- 1) **Напишите свои ФИО и номер варианта.** Вариант можно найти в Списке баллов с лекциями.
- 2) Решите задачи.
- 3) Оформите четко и разборчиво. **Не забудьте написать условие задачи.**
- 4) Теоретический материал можно найти в *Лекции 2*, а также в учебных пособиях *С.В. Сизого «Лекции по дифференциальной геометрии»*.
- 5) **Ответы обязательно выделите.**
- 6) Сверьтесь с ответами из файла. Если ответ совпал, **поставьте знак плюс.**
- 7) Сделайте качественные фото.
- 8) Вставьте по порядку в ворд файл и сделайте единый pdf файл.
Или отсканируйте Вашу работу, сшив страницы, создав pdf файл.
- 9) Не забудьте отправить файл.

Найти кривую единичной скорости, положительно эквивалентную кривой $\alpha(t) = (t, (at + b)^{3/2})$ при помощи натурального параметра s , если $t_0 = -\frac{b}{a} - \frac{4}{9a^3}$. Найти: $s(t)$, $t(s)$, $\beta(s)$, $\beta(1)$

Вариант	$\alpha(t)$	t_0	$s(t)$	$t(s)$	$\beta(s)$	$\beta(1)$
1	$\alpha(t) = \{t, (2-5t)^{3/2}\}$	$\frac{454}{1125}$	$-\frac{(225(2-5t)+4)^{3/2}}{3375}$	$\frac{454-225s^{2/3}}{1125}$	$\left\{\frac{225(2-s^{2/3})+4}{1125}, \frac{1}{27}\left(9s^{2/3}-\frac{4}{25}\right)^{3/2}\right\}$	$\left\{\frac{229}{1125}, \frac{221\sqrt{221}}{3375}\right\}$
2	$\alpha(t) = \{t, (1-t)^{3/2}\}$	$\frac{13}{9}$	$-\frac{1}{27}(9(1-t)+4)^{3/2}$	$\frac{1}{9}(13-9s^{2/3})$	$\left\{\frac{1}{9}(9(1-s^{2/3})+4), \frac{1}{27}(9s^{2/3}-4)^{3/2}\right\}$	$\left\{\frac{4}{9}, \frac{5\sqrt{5}}{27}\right\}$
3	$\alpha(t) = \{t, (3-5t)^{3/2}\}$	$\frac{679}{1125}$	$-\frac{(225(3-5t)+4)^{3/2}}{3375}$	$\frac{679-225s^{2/3}}{1125}$	$\left\{\frac{225(3-s^{2/3})+4}{1125}, \frac{1}{27}\left(9s^{2/3}-\frac{4}{25}\right)^{3/2}\right\}$	$\left\{\frac{454}{1125}, \frac{221\sqrt{221}}{3375}\right\}$
4	$\alpha(t) = \{t, (2-4t)^{3/2}\}$	$\frac{73}{144}$	$-\frac{(144(2-4t)+4)^{3/2}}{1728}$	$\frac{1}{576}(292-144s^{2/3})$	$\left\{\frac{1}{576}(144(2-s^{2/3})+4), \frac{1}{27}\left(9s^{2/3}-\frac{1}{4}\right)^{3/2}\right\}$	$\left\{\frac{37}{144}, \frac{35\sqrt{35}}{216}\right\}$
5	$\alpha(t) = \{t, (2-3t)^{3/2}\}$	$\frac{166}{243}$	$-\frac{1}{729}(81(2-3t)+4)^{3/2}$	$\frac{1}{243}(166-81s^{2/3})$	$\left\{\frac{1}{243}(81(2-s^{2/3})+4), \frac{1}{27}\left(9s^{2/3}-\frac{4}{9}\right)^{3/2}\right\}$	$\left\{\frac{85}{243}, \frac{77\sqrt{77}}{729}\right\}$
6	$\alpha(t) = \{t, (4-2t)^{3/2}\}$	$\frac{37}{18}$	$-\frac{1}{216}(36(4-2t)+4)^{3/2}$	$\frac{1}{72}(148-36s^{2/3})$	$\left\{\frac{1}{72}(36(4-s^{2/3})+4), \frac{1}{27}(9s^{2/3}-1)^{3/2}\right\}$	$\left\{\frac{14}{9}, \frac{16\sqrt{2}}{27}\right\}$
7	$\alpha(t) = \{t, (4-3t)^{3/2}\}$	$\frac{328}{243}$	$-\frac{1}{729}(81(4-3t)+4)^{3/2}$	$\frac{1}{243}(328-81s^{2/3})$	$\left\{\frac{1}{243}(81(4-s^{2/3})+4), \frac{1}{27}\left(9s^{2/3}-\frac{4}{9}\right)^{3/2}\right\}$	$\left\{\frac{247}{243}, \frac{77\sqrt{77}}{729}\right\}$
8	$\alpha(t) = \{t, (3-t)^{3/2}\}$	$\frac{31}{9}$	$-\frac{1}{27}(9(3-t)+4)^{3/2}$	$\frac{1}{9}(31-9s^{2/3})$	$\left\{\frac{1}{9}(9(3-s^{2/3})+4), \frac{1}{27}(9s^{2/3}-4)^{3/2}\right\}$	$\left\{\frac{22}{9}, \frac{5\sqrt{5}}{27}\right\}$
9	$\alpha(t) = \{t, (3-4t)^{3/2}\}$	$\frac{109}{144}$	$-\frac{(144(3-4t)+4)^{3/2}}{1728}$	$\frac{1}{576}(436-144s^{2/3})$	$\left\{\frac{1}{576}(144(3-s^{2/3})+4), \frac{1}{27}\left(9s^{2/3}-\frac{1}{4}\right)^{3/2}\right\}$	$\left\{\frac{73}{144}, \frac{35\sqrt{35}}{216}\right\}$
10	$\alpha(t) = \{t, (5-t)^{3/2}\}$	$\frac{49}{9}$	$-\frac{1}{27}(9(5-t)+4)^{3/2}$	$\frac{1}{9}(49-9s^{2/3})$	$\left\{\frac{1}{9}(9(5-s^{2/3})+4), \frac{1}{27}(9s^{2/3}-4)^{3/2}\right\}$	$\left\{\frac{40}{9}, \frac{5\sqrt{5}}{27}\right\}$
11	$\alpha(t) = \{t, (3-3t)^{3/2}\}$	$\frac{247}{243}$	$-\frac{1}{729}(81(3-3t)+4)^{3/2}$	$\frac{1}{243}(247-81s^{2/3})$	$\left\{\frac{1}{243}(81(3-s^{2/3})+4), \frac{1}{27}\left(9s^{2/3}-\frac{4}{9}\right)^{3/2}\right\}$	$\left\{\frac{166}{243}, \frac{77\sqrt{77}}{729}\right\}$
12	$\alpha(t) = \{t, (5-2t)^{3/2}\}$	$\frac{23}{9}$	$-\frac{1}{216}(36(5-2t)+4)^{3/2}$	$\frac{1}{72}(184-36s^{2/3})$	$\left\{\frac{1}{72}(36(5-s^{2/3})+4), \frac{1}{27}(9s^{2/3}-1)^{3/2}\right\}$	$\left\{\frac{37}{18}, \frac{16\sqrt{2}}{27}\right\}$
13	$\alpha(t) = \{t, (1-5t)^{3/2}\}$	$\frac{229}{1125}$	$-\frac{(225(1-5t)+4)^{3/2}}{3375}$	$\frac{229-225s^{2/3}}{1125}$	$\left\{\frac{225(1-s^{2/3})+4}{1125}, \frac{1}{27}\left(9s^{2/3}-\frac{4}{25}\right)^{3/2}\right\}$	$\left\{\frac{4}{1125}, \frac{221\sqrt{221}}{3375}\right\}$
14	$\alpha(t) = \{t, (2-t)^{3/2}\}$	$\frac{22}{9}$	$-\frac{1}{27}(9(2-t)+4)^{3/2}$	$\frac{1}{9}(22-9s^{2/3})$	$\left\{\frac{1}{9}(9(2-s^{2/3})+4), \frac{1}{27}(9s^{2/3}-4)^{3/2}\right\}$	$\left\{\frac{13}{9}, \frac{5\sqrt{5}}{27}\right\}$
15	$\alpha(t) = \{t, (5-5t)^{3/2}\}$	$\frac{1129}{1125}$	$-\frac{(225(5-5t)+4)^{3/2}}{3375}$	$\frac{1129-225s^{2/3}}{1125}$	$\left\{\frac{225(5-s^{2/3})+4}{1125}, \frac{1}{27}\left(9s^{2/3}-\frac{4}{25}\right)^{3/2}\right\}$	$\left\{\frac{904}{1125}, \frac{221\sqrt{221}}{3375}\right\}$
16	$\alpha(t) = \{t, (3-2t)^{3/2}\}$	$\frac{14}{9}$	$-\frac{1}{216}(36(3-2t)+4)^{3/2}$	$\frac{1}{72}(112-36s^{2/3})$	$\left\{\frac{1}{72}(36(3-s^{2/3})+4), \frac{1}{27}(9s^{2/3}-1)^{3/2}\right\}$	$\left\{\frac{19}{18}, \frac{16\sqrt{2}}{27}\right\}$
17	$\alpha(t) = \{t, (4-4t)^{3/2}\}$	$\frac{145}{144}$	$-\frac{(144(4-4t)+4)^{3/2}}{1728}$	$\frac{1}{576}(580-144s^{2/3})$	$\left\{\frac{1}{576}(144(4-s^{2/3})+4), \frac{1}{27}\left(9s^{2/3}-\frac{1}{4}\right)^{3/2}\right\}$	$\left\{\frac{109}{144}, \frac{35\sqrt{35}}{216}\right\}$
18	$\alpha(t) = \{t, (2-2t)^{3/2}\}$	$\frac{19}{18}$	$-\frac{1}{216}(36(2-2t)+4)^{3/2}$	$\frac{1}{72}(76-36s^{2/3})$	$\left\{\frac{1}{72}(36(2-s^{2/3})+4), \frac{1}{27}(9s^{2/3}-1)^{3/2}\right\}$	$\left\{\frac{5}{9}, \frac{16\sqrt{2}}{27}\right\}$
19	$\alpha(t) = \{t, (1-2t)^{3/2}\}$	$\frac{5}{9}$	$-\frac{1}{216}(36(1-2t)+4)^{3/2}$	$\frac{1}{72}(40-36s^{2/3})$	$\left\{\frac{1}{72}(36(1-s^{2/3})+4), \frac{1}{27}(9s^{2/3}-1)^{3/2}\right\}$	$\left\{\frac{1}{18}, \frac{16\sqrt{2}}{27}\right\}$
20	$\alpha(t) = \{t, (4-5t)^{3/2}\}$	$\frac{904}{1125}$	$-\frac{(225(4-5t)+4)^{3/2}}{3375}$	$\frac{904-225s^{2/3}}{1125}$	$\left\{\frac{225(4-s^{2/3})+4}{1125}, \frac{1}{27}\left(9s^{2/3}-\frac{4}{25}\right)^{3/2}\right\}$	$\left\{\frac{679}{1125}, \frac{221\sqrt{221}}{3375}\right\}$

21	$\alpha(t) = \{t, (4-t)^{3/2}\}$	$\frac{40}{9}$	$-\frac{1}{27} (9(4-t) + 4)^{3/2}$	$\frac{1}{9} (40 - 9s^{2/3})$	$\left\{ \frac{1}{9} (9(4 - s^{2/3}) + 4), \frac{1}{27} (9s^{2/3} - 4)^{3/2} \right\}$	$\left\{ \frac{31}{9}, \frac{5\sqrt{5}}{27} \right\}$
22	$\alpha(t) = \{t, (1-3t)^{3/2}\}$	$\frac{85}{243}$	$-\frac{1}{729} (81(1-3t) + 4)^{3/2}$	$\frac{1}{243} (85 - 81s^{2/3})$	$\left\{ \frac{1}{243} (81(1 - s^{2/3}) + 4), \frac{1}{27} (9s^{2/3} - \frac{4}{9})^{3/2} \right\}$	$\left\{ \frac{4}{243}, \frac{77\sqrt{77}}{729} \right\}$
23	$\alpha(t) = \{t, (5-3t)^{3/2}\}$	$\frac{409}{243}$	$-\frac{1}{729} (81(5-3t) + 4)^{3/2}$	$\frac{1}{243} (409 - 81s^{2/3})$	$\left\{ \frac{1}{243} (81(5 - s^{2/3}) + 4), \frac{1}{27} (9s^{2/3} - \frac{4}{9})^{3/2} \right\}$	$\left\{ \frac{328}{243}, \frac{77\sqrt{77}}{729} \right\}$
24	$\alpha(t) = \{t, (5-4t)^{3/2}\}$	$\frac{181}{144}$	$-\frac{(144(5-4t)+4)^{3/2}}{1728}$	$\frac{1}{576} (724 - 144s^{2/3})$	$\left\{ \frac{1}{576} (144(5 - s^{2/3}) + 4), \frac{1}{27} (9s^{2/3} - \frac{1}{4})^{3/2} \right\}$	$\left\{ \frac{145}{144}, \frac{35\sqrt{35}}{216} \right\}$
25	$\alpha(t) = \{t, (1-4t)^{3/2}\}$	$\frac{37}{144}$	$-\frac{(144(1-4t)+4)^{3/2}}{1728}$	$\frac{1}{576} (148 - 144s^{2/3})$	$\left\{ \frac{1}{576} (144(1 - s^{2/3}) + 4), \frac{1}{27} (9s^{2/3} - \frac{1}{4})^{3/2} \right\}$	$\left\{ \frac{1}{144}, \frac{35\sqrt{35}}{216} \right\}$