

## 数理科学科だより

## もんげー！ あの“ゆるキャラ”ズラ！

毎号、各執筆者が趣向を凝らした話題をお届けしている本シリーズですが、ちょっとこのあたりで Coffee Break、一息入れることにしましょう。

座標平面において、点  $P(x, y)$  の各座標  $x, y$  が変数  $t$  の関数として、 $x = f(t), y = g(t)$  と表されているとき、 $t$  の値を変化させると、 $P$  は曲線を描きます。このとき、 $x = f(t), y = g(t)$  をこの曲線の媒介変数表示と言います。楕円や双曲線の媒介変数表示は良く知っていることと思います。また、サイクロイドやアステロイドと呼ばれる曲線の媒介変数表示を目にしたこともあるでしょう。これら曲線はいずれも三角関数を用いて表現されています。

では、ここで問題です。裏面の関数  $f(t), g(t)$  を用いた媒介変数表示  $x = f(t), y = g(t)$  で表される曲線は一体何でしょうか？実際に PC を使って描いてみると、…



どことなくあのゆるキャラの後ろ姿に見えませんか？（文：宮澤）

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<http://www.sci.yamaguchi-u.ac.jp/dep/math/ex>

$$\begin{aligned}
f(t) = & \frac{1853}{6} \cos(t) + \frac{2546}{23} \cos(2t) + \frac{7491}{26} \cos(3t) + \frac{145}{17} \cos(4t) - \frac{1085}{8} \cos(5t) + \frac{1321}{13} \cos(6t) + \frac{3295}{28} \cos(7t) - \frac{1978}{31} \cos(8t) + \frac{162}{5} \cos(9t) \\
& - \frac{505}{13} \cos(10t) - \frac{2252}{43} \cos(11t) + \frac{296}{15} \cos(12t) + \frac{121}{14} \cos(13t) + \frac{447}{26} \cos(14t) - \frac{461}{29} \cos(15t) + \frac{351}{18} \cos(16t) - \frac{36}{29} \cos(17t) - \frac{124}{13} \cos(18t) \\
& + \frac{383}{28} \cos(19t) + \frac{13}{14} \cos(20t) - \frac{361}{13} \cos(21t) + \frac{191}{17} \cos(22t) - \frac{109}{28} \cos(23t) - \frac{201}{50} \cos(24t) + \frac{117}{7} \cos(25t) - \frac{415}{27} \cos(26t) - \frac{150}{13} \cos(27t) \\
& + \frac{153}{24} \cos(28t) + \frac{233}{24} \cos(29t) - \frac{827}{53} \cos(30t) + \frac{90}{19} \cos(31t) + \frac{81}{22} \cos(32t) - \frac{23}{19} \cos(33t) - \frac{39}{13} \cos(34t) + \frac{23}{27} \cos(35t) + \frac{39}{16} \cos(36t) \\
& \frac{51}{21} \cos(37t) + \frac{77}{18} \cos(38t) - \frac{76}{61} \cos(39t) + \frac{7}{13} \cos(40t) - \frac{58}{21} \cos(41t) - \frac{137}{27} \cos(42t) + \frac{5}{24} \cos(43t) + \frac{23}{6} \cos(44t) + \frac{57}{26} \cos(45t) - \frac{74}{11} \cos(46t) \\
& \frac{20}{17} \cos(47t) + \frac{238}{41} \cos(48t) + \frac{13}{10} \cos(49t) - \frac{8}{3} \cos(50t) + \frac{18}{11} \cos(51t) + \frac{25}{16} \cos(52t) + \frac{1}{11} \cos(53t) - \frac{70}{69} \cos(54t) - \frac{71}{26} \cos(55t) + \frac{246}{247} \cos(56t) \\
& + \frac{51}{21} \cos(57t) + \frac{13}{18} \cos(58t) + \frac{17}{7} \cos(59t) + \frac{2}{5} \cos(60t) - \frac{37}{27} \cos(61t) - \frac{23}{23} \cos(62t) - \frac{8}{13} \cos(63t) + \frac{12}{17} \cos(64t) - \frac{8}{11} \cos(65t) + \frac{35}{24} \cos(66t) \\
& + \frac{2}{5} \cos(67t) - \frac{13}{12} \cos(68t) - \frac{2}{21} \cos(69t) + \frac{55}{28} \cos(70t) + \frac{69}{70} \cos(71t) - \frac{23}{21} \cos(72t) - \frac{59}{49} \cos(73t) + \frac{28}{25} \cos(74t) + \frac{31}{24} \cos(75t) - \frac{27}{53} \cos(76t) \\
& - \frac{53}{25} \cos(77t) + \frac{13}{25} \cos(78t) + \frac{51}{38} \cos(79t) - \frac{21}{21} \cos(80t) - \frac{14}{9} \cos(81t) + \frac{25}{23} \cos(82t) - \frac{6}{35} \cos(83t) - \frac{7}{16} \cos(84t) + \frac{3}{17} \cos(85t) - \frac{19}{27} \cos(86t) \\
& + \frac{21}{19} \cos(87t) + \frac{101}{21} \cos(88t) - \frac{23}{34} \cos(89t) + \frac{19}{31} \cos(90t) + \frac{2}{19} \cos(92t) - \frac{1}{16} \cos(93t) - \frac{183}{23} \cos(94t) + \frac{24}{19} \cos(95t) + \frac{2}{5} \cos(96t) - \frac{13}{18} \cos(97t) \\
& + \frac{5}{23} \cos(98t) - \frac{1}{27} \cos(99t) - \frac{14}{25} \cos(100t) + \frac{30891}{19} \sin(t) - \frac{3742}{33} \sin(2t) + \frac{3601}{72} \sin(3t) - \frac{445}{13} \sin(4t) + \frac{177}{10} \sin(5t) - \frac{435}{11} \sin(6t) - \frac{17}{9} \sin(7t) \\
& + \frac{3891}{5} \sin(8t) + \frac{333}{5} \sin(9t) + \frac{982}{51} \sin(10t) - \frac{347}{24} \sin(11t) - \frac{2161}{31} \sin(12t) + \frac{76}{13} \sin(13t) - \frac{593}{15} \sin(14t) + \frac{4093}{178} \sin(15t) + \frac{154}{17} \sin(16t) \\
& - \frac{102}{11} \sin(17t) - \frac{61}{13} \sin(18t) + \frac{32}{11} \sin(19t) - \frac{8}{33} \sin(20t) + \frac{177}{19} \sin(21t) + \frac{22}{13} \sin(22t) - \frac{133}{22} \sin(23t) - \frac{7}{11} \sin(24t) + \frac{81}{19} \sin(25t) - \frac{172}{19} \sin(26t) \\
& + \frac{15}{15} \sin(27t) + \frac{88}{35} \sin(28t) + \frac{67}{68} \sin(29t) + \frac{47}{9} \sin(30t) + \frac{55}{13} \sin(31t) - \frac{2569}{321} \sin(32t) + \frac{37}{24} \sin(33t) - \frac{147}{32} \sin(34t) + \frac{23}{23} \sin(35t) + \frac{44}{9} \sin(36t) \\
& \frac{293}{28} \sin(37t) - \frac{257}{55} \sin(38t) + \frac{125}{14} \sin(39t) + \frac{126}{23} \sin(40t) - \frac{170}{27} \sin(41t) - \frac{10}{19} \sin(42t) + \frac{46}{17} \sin(43t) + \frac{77}{20} \sin(44t) - \frac{71}{20} \sin(45t) \\
& - \frac{8}{9} \sin(46t) + \frac{7}{20} \sin(47t) + \frac{18}{13} \sin(49t) - \frac{1}{5} \sin(50t) + \frac{8}{17} \sin(51t) + \frac{12}{19} \sin(52t) + \frac{8}{13} \sin(53t) - \frac{20}{23} \sin(54t) + \frac{3}{16} \sin(55t) + \frac{8}{19} \sin(56t) \\
& - \frac{29}{16} \sin(57t) - \frac{14}{4} \sin(58t) + \frac{5}{8} \sin(59t) + \frac{15}{14} \sin(60t) + \frac{9}{17} \sin(61t) + \frac{48}{19} \sin(62t) - \frac{41}{19} \sin(63t) - \frac{29}{39} \sin(64t) + \frac{13}{25} \sin(65t) + \frac{13}{13} \sin(66t) \\
& - \frac{26}{23} \sin(67t) - \frac{4}{8} \sin(68t) + \frac{11}{10} \sin(69t) + \frac{9}{8} \sin(70t) - \frac{11}{21} \sin(71t) - \frac{10}{49} \sin(72t) - \frac{1}{12} \sin(73t) - \frac{17}{19} \sin(74t) + \frac{4}{3} \sin(75t) - \frac{7}{8} \sin(76t) \\
& + \frac{4}{13} \sin(77t) + \frac{5}{7} \sin(78t) - \frac{18}{11} \sin(79t) - \frac{27}{25} \sin(80t) + \frac{21}{13} \sin(81t) + \frac{17}{29} \sin(82t) - \frac{1}{38} \sin(83t) - \frac{11}{20} \sin(84t) - \frac{81}{21} \sin(85t) + \frac{19}{25} \sin(86t) \\
& + \frac{5}{22} \sin(87t) - \frac{1}{2} \sin(88t) + \frac{13}{51} \sin(89t) + \frac{28}{23} \sin(90t) - \frac{6}{13} \sin(91t) - \frac{32}{33} \sin(92t) + \frac{9}{26} \sin(93t) - \frac{27}{40} \sin(94t) + \frac{9}{11} \sin(95t) + \frac{2}{17} \sin(96t) \\
& + \frac{1}{96} \sin(97t) - \frac{5}{24} \sin(98t) + \frac{1}{5} \sin(99t) - \frac{7}{24} \sin(100t) \\
g(t) = & \frac{34301}{20} \cos(t) + \frac{2077}{20} \cos(2t) + \frac{4826}{29} \cos(3t) - \frac{257}{6} \cos(4t) + \frac{1957}{21} \cos(5t) + \frac{3504}{29} \cos(6t) + \frac{1055}{19} \cos(7t) + \frac{497}{22} \cos(8t) - \frac{581}{9} \cos(9t) \\
& \frac{739}{22} \cos(10t) + \frac{383}{19} \cos(11t) - \frac{328}{3} \cos(12t) - \frac{403}{21} \cos(13t) + \frac{589}{21} \cos(14t) + \frac{493}{21} \cos(15t) + \frac{323}{22} \cos(16t) - \frac{703}{22} \cos(17t) + \frac{346}{21} \cos(18t) \\
& - \frac{305}{38} \cos(19t) + \frac{101}{19} \cos(20t) + \frac{708}{25} \cos(21t) + \frac{17}{5} \cos(22t) - \frac{248}{23} \cos(23t) - \frac{291}{25} \cos(24t) + \frac{846}{77} \cos(25t) - \frac{165}{26} \cos(26t) + \frac{212}{13} \cos(27t) \\
& - \frac{103}{6} \cos(28t) + \frac{171}{16} \cos(29t) + \frac{3}{13} \cos(30t) - \frac{219}{26} \cos(31t) - \frac{22}{17} \cos(32t) + \frac{55}{37} \cos(33t) - \frac{253}{30} \cos(34t) - \frac{11}{25} \cos(35t) + \frac{40}{21} \cos(36t) \\
& - \frac{62}{22} \cos(37t) + \frac{132}{25} \cos(38t) + \frac{44}{19} \cos(39t) - \frac{18}{7} \cos(40t) + \frac{135}{28} \cos(41t) + \frac{64}{27} \cos(42t) + \frac{7}{13} \cos(43t) - \frac{81}{19} \cos(44t) + \frac{20}{19} \cos(45t) \\
& + \frac{91}{90} \cos(46t) + \frac{37}{29} \cos(47t) + \frac{8}{19} \cos(48t) - \frac{1}{3} \cos(49t) - \frac{25}{22} \cos(50t) + \frac{21}{17} \cos(51t) - \frac{11}{16} \cos(52t) - \frac{24}{17} \cos(53t) + \frac{11}{15} \cos(54t) - \frac{25}{18} \cos(55t) \\
& \frac{17}{16} \cos(56t) + \frac{25}{31} \cos(57t) - \frac{127}{51} \cos(58t) + \frac{37}{26} \cos(59t) + \frac{15}{17} \cos(60t) - \frac{64}{63} \cos(61t) + \frac{27}{13} \cos(62t) + \frac{17}{23} \cos(63t) - \frac{36}{19} \cos(64t) + \frac{19}{18} \cos(65t) \\
& + \frac{65}{38} \cos(66t) - \frac{29}{22} \cos(67t) + \frac{44}{31} \cos(68t) - \frac{24}{17} \cos(69t) - \frac{3}{23} \cos(70t) - \frac{17}{12} \cos(71t) - \frac{1}{12} \cos(72t) - \frac{8}{9} \cos(73t) + \frac{70}{33} \cos(74t) - \frac{60}{59} \cos(75t) \\
& - \frac{48}{29} \cos(76t) + \frac{58}{117} \cos(77t) + \frac{16}{23} \cos(78t) - \frac{19}{17} \cos(79t) - \frac{47}{26} \cos(80t) + \frac{47}{18} \cos(81t) + \frac{9}{20} \cos(82t) + \frac{26}{29} \cos(83t) - \frac{27}{22} \cos(84t) + \frac{1}{30} \cos(85t) \\
& + \frac{9}{10} \cos(86t) - \frac{15}{28} \cos(87t) + \frac{13}{30} \cos(88t) + \frac{8}{15} \cos(89t) + \frac{5}{11} \cos(90t) - \frac{35}{25} \cos(91t) + \frac{1}{7} \cos(92t) - \frac{6}{29} \cos(93t) - \frac{15}{26} \cos(94t) + \frac{19}{28} \cos(95t) \\
& \frac{6}{19} \cos(96t) + \frac{3}{16} \cos(97t) - \frac{11}{18} \cos(98t) + \frac{11}{17} \cos(99t) - \cos(100t) - \frac{20924}{19} \sin(t) - \frac{6313}{17} \sin(2t) - \frac{4091}{18} \sin(3t) + \frac{2321}{28} \sin(4t) \\
& \frac{1203}{29} \sin(5t) + \frac{763}{22} \sin(6t) - \frac{1648}{17} \sin(7t) - \frac{1061}{31} \sin(8t) - \frac{275}{4} \sin(9t) - \frac{987}{19} \sin(10t) + \frac{2509}{27} \sin(11t) + \frac{148}{13} \sin(12t) - \frac{185}{29} \sin(13t) \\
& - \frac{356}{19} \sin(14t) + \frac{611}{17} \sin(15t) + \frac{138}{11} \sin(16t) + \frac{345}{18} \sin(17t) + \frac{110}{37} \sin(18t) - \frac{62}{19} \sin(19t) - \frac{223}{19} \sin(20t) - \frac{242}{45} \sin(21t) - \frac{3970}{441} \sin(22t) \\
& + \frac{839}{42} \sin(23t) - \frac{272}{19} \sin(24t) + \frac{376}{41} \sin(25t) - \frac{51}{13} \sin(26t) + \frac{40}{13} \sin(27t) + \frac{29}{35} \sin(28t) - \frac{349}{50} \sin(29t) - \frac{276}{35} \sin(30t) - \frac{4}{9} \sin(31t) \\
& + \frac{91}{8} \sin(32t) - \frac{29}{24} \sin(33t) + \frac{37}{24} \sin(34t) - \frac{26}{5} \sin(35t) + \frac{65}{16} \sin(36t) + \frac{68}{15} \sin(37t) - \frac{26}{21} \sin(38t) + \frac{115}{26} \sin(39t) + \frac{85}{18} \sin(40t) - \frac{55}{23} \sin(41t) \\
& \frac{128}{21} \sin(42t) + \frac{68}{41} \sin(43t) - \frac{18}{17} \sin(44t) - \frac{103}{28} \sin(45t) + \frac{83}{20} \sin(46t) + \frac{13}{14} \sin(47t) - \frac{4}{15} \sin(48t) + \frac{12}{17} \sin(49t) - \frac{14}{31} \sin(50t) - \frac{71}{71} \sin(51t) \\
& + \frac{28}{57} \sin(52t) - \frac{3}{15} \sin(53t) + \frac{23}{18} \sin(54t) - \frac{11}{20} \sin(55t) - \frac{17}{17} \sin(56t) + \frac{5}{19} \sin(57t) + \frac{14}{6} \sin(58t) + \frac{21}{20} \sin(59t) + \frac{26}{11} \sin(60t) + \frac{28}{17} \sin(61t) \\
& + \frac{23}{37} \sin(62t) - \frac{17}{10} \sin(63t) - \frac{29}{24} \sin(64t) + \frac{1}{18} \sin(65t) - \frac{15}{14} \sin(66t) - \frac{13}{23} \sin(67t) + \frac{67}{45} \sin(68t) - \frac{1}{14} \sin(69t) - \frac{52}{51} \sin(70t) - \frac{17}{19} \sin(71t) \\
& + \frac{4}{25} \sin(72t) + \frac{34}{21} \sin(73t) - \frac{38}{27} \sin(74t) - \frac{18}{17} \sin(75t) + \frac{35}{26} \sin(76t) + \frac{8}{15} \sin(77t) - \frac{59}{27} \sin(78t) + \frac{11}{6} \sin(79t) - \frac{8}{31} \sin(80t) + \frac{76}{51} \sin(81t) \\
& \frac{12}{31} \sin(82t) - \frac{13}{24} \sin(83t) + \frac{57}{58} \sin(84t) + \frac{7}{17} \sin(85t) - \frac{40}{29} \sin(86t) - \frac{31}{24} \sin(87t) + \frac{5}{12} \sin(88t) + \frac{23}{40} \sin(89t) - \frac{1}{19} \sin(90t) - \frac{3}{4} \sin(91t) \\
& + \frac{13}{13} \sin(92t) + \frac{9}{8} \sin(93t) - \frac{8}{23} \sin(94t) - \frac{3}{8} \sin(95t) - \frac{8}{13} \sin(96t) - \frac{1}{19} \sin(97t) + \frac{1}{28} \sin(98t) + \frac{8}{29} \sin(99t) + \frac{19}{33} \sin(100t)
\end{aligned}$$