Calculus: Homework #9 Solutions

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Page 157, #1-12:

#1: Continuous but not differentiable.

#2: Not continuous and not differentiable.

#3: Not continuous and not differentiable.

#4: Continuous and differentiable.

#5: Not continuous and not differentiable.

#6: Not continuous and not differentiable.

#7: Continuous and differentiable.

#8: Not continuous and not differentiable.

#9: Not continuous and not differentiable.

#10: Not continuous and not differentiable.

#11: Continuous but not differentiable.

#12: Continuous and differentiable.

Page 163, q1 - q10:

q1) 243 x^{1214}

q2) 1/(x-1) - (x-3)/$(x-1)^2$ = 2/$(x-1)^2$

q3) cos x - x sin x

q4) $5x^4$ cos (x^5)

q5) $3x^2$

q6) 0

q7) -1/sqrt(1 - x^2)

q8) The graph is tan x, so the graph of the derivative will look like $\sec^2$ x.

q9) v(t) -3t + constant

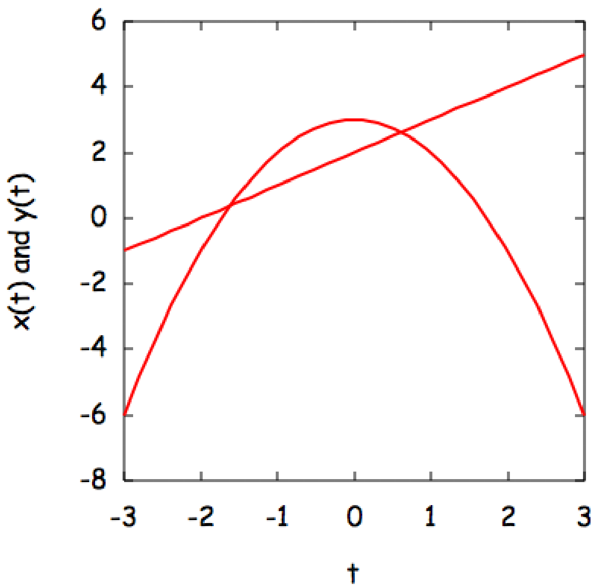
q10) One can't conclude anything since the integration constant is unknown.

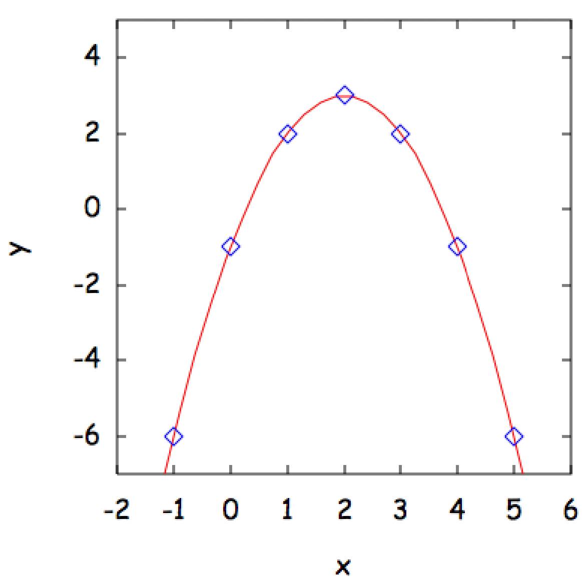
Page 163, #1:

a.

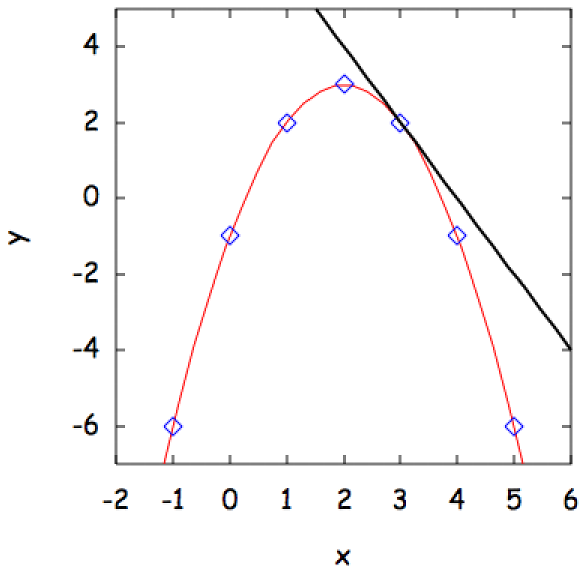
t	x	y
-3	-1	-6
-2	0	-1
-1	1	2
0	2	3
1	3	2
2	4	-1
3	5	-6

b.





c. dy/dx = dy/dt / dx/dt = -2t/1 = -2t. So at t=1, dydx = -2. The line through the point (3,2) with slope dy/dx is shown below.

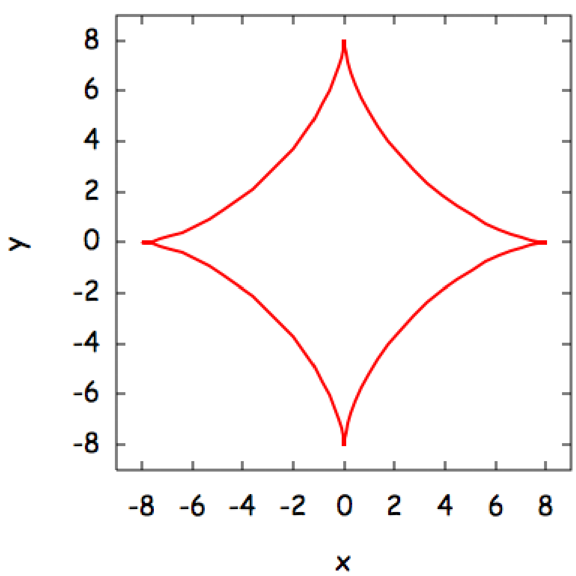


d. Eliminating t yields $y = 3 - (x - 2)^2 = -x^2 + 4x - 1$. This is a quadratic equations, hence its graph is a parabola.

e. The derivative from part d is dy/dx = -2x + 4. So when x=3, dy/dx = -2, the same value as found in part c.

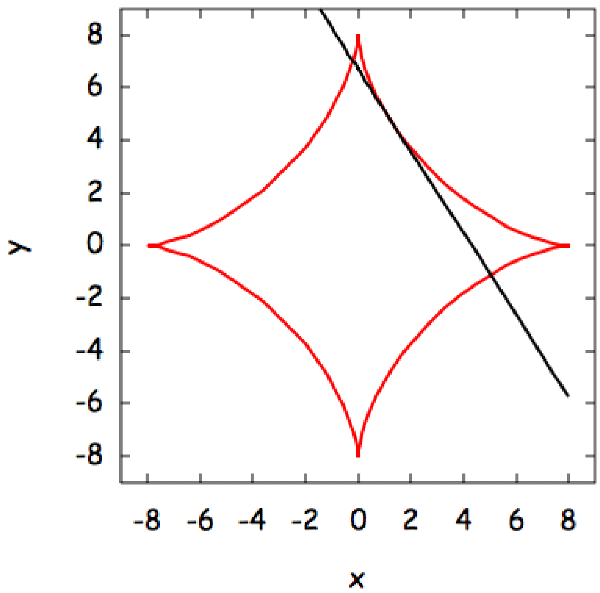
Page 163, #4:

a.



b. dy/dx = dy/dt / dx/dt = $(24 \sin^2 t \cos t) / (-24 \cos^2 t \sin t) = - \tan t$.

c. When t = 1, x = 1.2618, y = 4.766, and dy/dt = -1.5574. The line going through this point with this slope is shown below. Yes, the line is tangent to the graph:



d. At (8,0) the slope approaches infinity at the cusp, while at (0,8) the slope approaches zero at the cusp.

e. Solving each equation for t yields cos t = $(x/8)^{1/3}$ = 1/2 $x^{1/3}$ and sin t = $(y/8)^{1/3}$ = 1/2 $y^{1/3}$. With $\cos^2$ t + $\sin^2$ t = 1, we have $x^{2/3} + y^{2/3} = 4$.

Page 170, #1-12:

#1: $3x^2 + 28y^3y' = 0, \quad y' = -3x^2/28y^3$

#2: $15x^4 - 4y^3y' = 0, \quad y' = 15x^4/4y^3$

#3: $6x^5y^9 + 9x^6y^8y' + 3 - 3y^2y' = 0, \quad y' = (1 + 2x^5y^9)/(y^2 - 3x^6y^8)$

#4: $4 + 16xy^6 + 48x^2y^5y' + 4y^3y' = 0, \quad y' = -(1 + 4xy^6)/(12x^2y^5 + y^3)$

#5: $1 + y + xy' + y' = 2\cos 2x, \quad y' = (2\cos 2x - y - 1)/(x + 1)$

#6: $-\sin(xy)(y + xy') = 1 + 2y', \quad y' = -[1 + y\sin(xy)]/[x\sin(xy) + 2]$

#7: $0.5x^{-0.5} - 0.5y^{-0.5}y' = 0, \quad y' = (y/x)^{0.5}$

#8: $1.2x^{0.2} + 1.2y^{0.2}y' = 0, \quad y' = -(x/y)^{0.2}$

#9: $8yy' + 18x = 0, \quad y' = -9x/4y$

#10: $50yy' - 32x = 0, \quad y' = 16x/25y$

#11: $15x^{14}y^{20} + 20x^{15}y^{19}y' = 1 - y', \quad y' = (1 - 15x^{14}y^{20})/(1 + 20x^{15}y^{19})$

#12: $6x^5y^6 + 6x^6y^5y' = 1 + y', \quad y' = (1 - 65x^5y^6)/(1 - 6x^6y^5)$