Assignment 6 (SOLUTION from Textbook Manual Solution)

Text: *Calculus for the Life Sciences, S. Schreiber, K. Smith and W. Getz, Wiley, 2014*

Section 2.7

29. $f'(x) = 2x - 1$; this is negative when $x < 1/2$ and positive when $x > 1/2$, thus f is decreasing on $(-\infty, 1/2)$ and increasing on $(1/2, \infty)$.

49. Let $d(t)$ be the distance of the sports car from the first patrol car. We can suppose that $d(t)$ is a differentiable function. By the Mean Value Theorem, there is some time instance c between $t = 0$ and $t = 1/12$ (hours) such that its speed $d'(c) =$

$(d(1/12) - d(0))/(1/12) = 6/(1/12) = 72$ miles per hour.

Section 3.3

19. Differentiate both sides with respect to x, using the chain rule: $2x + dy/dx = 3x^2 + 3y^2 dy/dx$; solve for dy/dx to obtain $dy/dx = (3x^2 - 2x)/(1 - 3y^2)$.

22. Differentiate both sides with respect to x, using the chain rule: $-y^{-2}dy/dx - 1/x^2 = 0$; solve for dy/dx to obtain $dy/dx = -y^2/x^2$.

23. Differentiate both sides with respect to x, using the chain rule. We obtain that $2(2x + 3y)(2 + 3dy/dx) = 0$; solve for dy/dx to obtain $dy/dx = -2/3$.

Section 3.4

7. Using the product rule, $dy/dx = -e^{-x}\sin x + e^{-x}\cos x = e^{-x}(\cos x - \sin x)$.

16. Using the quotient rule, we get $f'(x) =$

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$(\cos x(1-\cos x) - \sin x \sin x)/(1-\cos x)^2 = -1/(1-\cos x)$.

18. Using the chain rule, we obtain $y'(t) = 6t^2 \cos(2t^3 + 1)$.

24. Using the quotient rule, we get $f'(x) = (-\sin x \sin x - \cos x \cos x)/(\sin^2 x) = -1/\sin^2 x = -\csc^2 x$.

31. $P'(t) = -100e^{-t} \sin t + 100e^{-t} \cos t$, so $P'(2) \approx -17.94$. The population is decreasing, at a rate about 18 fish per month.