

Calculus: Homework #7 Solutions

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Page 115, q1-q10:

q1) $9x^8$

q2) $-3\sin x$

q3) $72 x^5 (5x^6 + 11)^{1.4}$

q4) 0

q5) 13

q6) 1

q7) yes

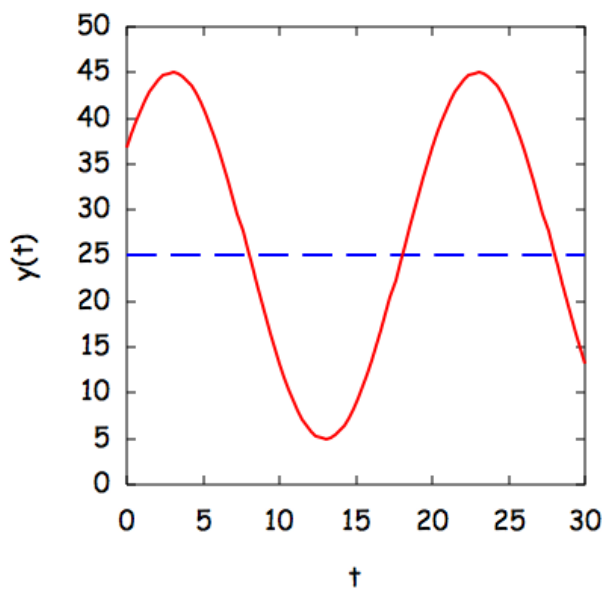
q8) $-\cos(x^2) + \text{constant}$

q9) 1

q10) a straight line crossing the x-axis where the parabola has a minimum.

Page 115, #1:

- a. The general form of a sinusoid is $y = C + A \cos B(x - D)$. In this case C , the axis of the sinusoid, is the 25 ft above the ground. A is the amplitude of the sinusoid, in this case the radius of the Ferris Wheel. B is the frequency of the sinusoid, 2π /period. We're given the wheel does 3 revs/min, so the time to do one complete revolution (the period) is 20 sec. So, $B = 2\pi/20 = \pi/10$. The phase displacement is the time it takes from your starting point to the high point, which we're told is 3 ft. Thus, $y = 25 + 20 \cos \pi/10 (t - 3)$ feet.



b. $y' = -2\pi \sin \pi/10 (t - 3)$ feet/sec

c. Since $y'(15) = 3.693$, $y(t)$ is increasing at about 3.7 feet/sec, and the seat is $y(15) = 25$ feet above the ground.

d. The fastest $y(t)$ changes is 2π feet/sec.

Page 121, q1-q10:

q1) squeeze theorem

q2) 1

q3) $-\sin x$

q4) $\sin x + \text{constant}$

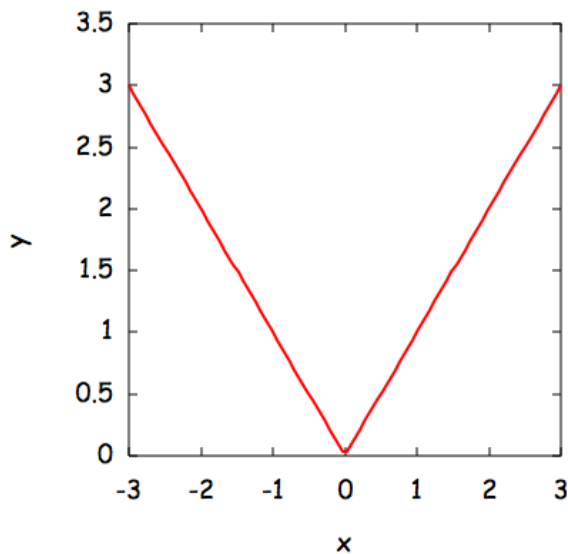
q5) no.

q6) x^3

q7) x^{48}

q8) $\log 32 = \log 2^5 = 5 \log 2$

q9)



q10) the cube

Page 121, #1: $f' = 7x^6$, $f(x) = x^7 + \text{const}$

Page 121, #2: $f' = 10x^9$, $f(x) = x^{10} + \text{const}$

Page 121, #3: $f' = x^5$, $f(x) = 1/6 x^6 + \text{const}$

Page 121, #4: $f' = x^4, \quad f(x) = 1/5 x^5 + \text{const}$

Page 121, #5: $f' = x^{-9}, \quad f(x) = -1/8 x^{-8} + \text{const}$

Page 121, #6: $f' = 7x^{-1066}, \quad f(x) = -1/1065 x^{-1065} + \text{const}$

Page 121, #7: $f' = \cos x, \quad f(x) = \sin x + \text{const}$

Page 121, #8: $f' = \sin x, \quad f(x) = -\cos x + \text{const}$

Page 121, #9: $f' = 36x^{7/2}, \quad f(x) = 8 x^{9/2} + \text{const}$

Page 121, #10: $f' = 77x^{4/3}, \quad f(x) = 33 x^{7/3} + \text{const}$

Page 121, #11: $f' = \sin 5x, \quad f(x) = -1/5 \cos(5x) + \text{const}$

Page 121, #12: $f' = \cos 4x, \quad f(x) = 1/4 \sin(4x) + \text{const}$

Page 121, #13: $f' = (4x + 5)^7, \quad f(x) = 1/32 (4x + 5)^8 + \text{const}$

Page 121, #14: $f' = (8x + 3)^5, \quad f(x) = 1/48 (8x + 3)^6 + \text{const}$

Page 121, #15: $f' = x^2 + 6x + 5, \quad f(x) = 1/3 x^3 + 3x^2 + 5x + \text{const}$

Page 121, #16: $f' = x^2 - 10x + 7, \quad f(x) = 1/3 x^3 - 5x^2 + 7x + \text{const}$

Page 134, #1: $f(x) = x^3 \cos x, \quad f' = 3x^2 \cos x - x^3 \sin x$

Page 134, #2: $f(x) = x^4 \sin x, \quad f' = 4x^3 \sin x + x^4 \cos x$

Page 134, #3: $g(x) = x^{1.5} \sin 7x, \quad g' = 1.5 x^{0.5} \sin 7x + 7 x^{1.5} \cos 7x$

Page 134, #4: $h(x) = x^{-6.3} \cos 10x, \quad h' = -6.3 x^{-7.3} \cos 10x - 10 x^{-6.3} \sin 10x$

Page 134, #5: $y = x^7(2x + 5)^{10}, \quad y' = 7x^6(2x + 5)^{10} + 20 x^7(2x + 5)^9$

Page 134, #6: $y = x^8(3x + 7)^9, \quad y' = 8x^7(3x + 7)^9 + 27 x^8(3x + 7)^8$

Page 134, #7: $z = x^4 \cos^5 3x, \quad z' = 4x^3 \cos^5 3x - 15 x^4 \cos^4 3x \sin 3x$

Page 134, #8: $\nu = x^5 \sin^3 6x, \quad \nu' = 5x^4 \sin^3 6x + 18 x^5 \sin^2 6x \cos 6x$

Page 134, #9: $d/dx[(4x - 3)^6 \sin 5x] = 24 (4x - 3)^5 \sin 5x + 5 (4x - 3)^6 \cos 5x$

Page 134, #10: $p = (7x - 3)^9(6x - 1)^5, \quad p' = 63(7x - 3)^8(6x - 1)^5 + 30(7x - 3)^9(6x - 1)^4$

Page 134, #11: $y = (6x + 11)^4(5x - 9)^7, \quad y' = 24(6x + 11)^3(5x - 9)^7 + 35(6x + 11)^4(5x - 9)^6$

Page 134, #12: $y = (7x - 3)^9(6x - 1)^5, \quad y' = 63(7x - 3)^8(6x - 1)^5 + 30(7x - 3)^9(6x - 1)^4$

Page 134, #13: $P = (x^2 - 1)^{10}(x^2 + 1)^{15}, \quad P' = 20x(x^2 - 1)^9(x^2 + 1)^{15} + 30x(x^2 - 1)^{10}(x^2 + 1)^{14}$

Page 134, #14: $P(x) = (x^3 + 6)^4(x^3 + 4)^6, \quad P' = 12x^2(x^3 + 6)^4(x^3 + 4)^6 + 18x^2(x^3 + 6)^4(x^3 + 4)^6$

Page 134, #15: $a(t) = 4 \sin 3t \cos 5t, \quad a' = 12 \cos 3t \cos 5t - 20 \sin 3t \sin 5t$

Page 134, #16: $\nu = 7 \cos 2t \sin 6t, \quad \nu' = -14 \sin 2t \sin 6t + 42 \cos 2t \cos 6t$

Page 134, #17: $y = 10 \cos^8 5x \sin^5 8x, \quad y' = -400x \cos^7 5x \sin 5x \sin^5 8x + 400x \cos^8 5x \sin^4 8x \cos 8x$

Page 134, #18: $y = 7 \cos^3 4x \sin^4 3x, \quad y' = -92 \cos^2 4x \sin 4x \sin^4 3x + 92 \cos^3 4x \sin^3 3x \cos 3x$

Page 134, #19: $z = x^3(5x - 2)^4 \sin 6x, \quad z' = 3x^2(5x - 2)^4 \sin 6x + 20x^3(5x - 2)^3 \sin 6x + 6x^3(5x - 2)^4 \cos 6x$

Page 134, #20: $u = 3x^5(x^2 - 4) \cos 10x, \quad u' = 15x^4(x^2 - 4) \cos 10x + 6x^7 \cos 10x - 10 \cdot 3x^5(x^2 - 4) \sin 10x$

Page 134, #21: $y = \cos(3 \sin x), \quad y' = -3 \sin(3 \sin x) \cos x$

Page 134, #22: $y = \sin(5 \cos x), \quad y' = 5 \cos(5 \cos x) \sin x$