Calculus: Homework #6 Solutions

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Page 102, q1-q10:

q1) There are no real values. b^2 - 4ac ¡ 0.

q2) 10x

q3) -51x^{-4}

q4) 1.7$x^{0.7}$

q5) 3

q6) 45

q7) 30

q8) 45

q9) ϵ

q10) Integral

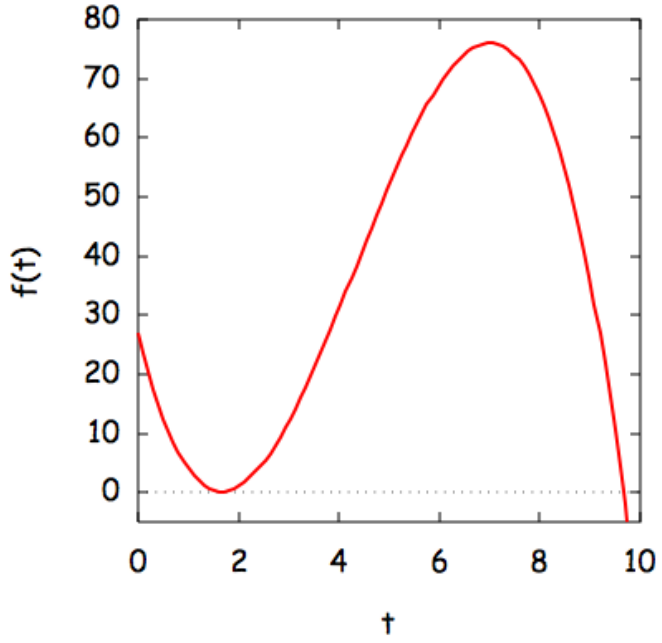
Page 102, #1:

$$y = 5t^4 - 3t^{2.4} + 7t$$
$$v = y' = 20t^3 - 7.2t^{1.4} + 7$$
$$a = v' = 60t^2 - 10.08t^{0.4}$$

Page 102, #2:

$$y = 0.3t^{-4} - 5t$$
$$v = y' = -1.2t^{-5} - 5$$
$$a = v' = 6t^{-6}$$

Page 102, #3:



The object start at position 27 and then decreases to zero around 1.8 seconds (negative derivative). The object then increases its position to a amaximum of about 75 at 7 seconds. The object's position then decreases without bound, crossing the zero position point at about 9.8 sec.

Page 109, #1: For y(x) = f(u) = g(h(x))

a. $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

b. $f' = g'(h(x)) \cdot h'(x)$

c. Derivative of outside times derivative of inside.

Page 109, #1: For $f(x) = (x^2 - 1)^3 = x^6 - 3x^4 + 3x^2 - 1$

a. $f' = 3(x^2 - 1)^2(2x)$

$= 6x(x^2 - 1)^2$

$= 6x(x^4 - 2x^2 + 1)^2$

$= 6x^5 - 12x^3 - 6x$

b. $f' = 6x^5 - 12x^3 - 6x$

c. The answers to a and b are identical.

Page 109, #3: $f(x) = \cos(3x), \quad f' = -3\sin(3x)$

Page 109, #4: $f(x) = \sin(5x), \quad f' = 5\cos(5x)$

Page 109, #5: $g(x) = \cos(x^3), \quad g' = -3x^2\sin(x^3)$

Page 109, #6: $h(x) = \sin(x^5), \quad h' = 5x^4\cos(x^5)$

Page 109, #7: $y = (\cos x)^3 = \cos^3 x\ , \quad y' = -3\cos^2 x\ (\sin x)$

Page 109, #8: $f(x) = (\sin x)^5 = \sin^5 x\ , \quad f' = 5\sin^4 x\ (\cos x)$

Page 109, #9: $y = \sin^6 x\ , \quad y' = 6\sin^5 x\ (\cos x)$

Page 109, #10: $f(x) = \cos^7 x\ , \quad f' = -7\cos^6 x\ (\sin x)$

Page 109, #11: $y = -6\sin 3x\ , \quad y' = -18\cos 3x$

Page 109, #12: $f(x) = 4\cos(-5x)\ , \quad f' = -20\sin(-5x)$

Page 109, #13: $\frac{d}{dx}\ \cos^4 7x = -28\ \cos^3 7x\ \sin 7x$

Page 109, #14: $\frac{d}{dx}\ \sin^9 13x = 117\ \sin^8 13x\ \cos 13x$

Page 109, #15: $f(x) = 24\ \sin^{5/3} 4x\ , \quad f' = 160\ \sin^{2/3} 4x\ \cos(4x)$

Page 109, #16: $f(x) = -100\sin^{6/5}(-9x)\ , \quad f' = 1080\ \sin^{1/5}(-9x)\ \cos(-9x)$

Page 109, #17: $f(x) = (5x + 3)^7\ , \quad f' = 35\ (5x + 3)^6$

Page 109, #18: $f(x) = (x^2 + 8)^9\ , \quad f' = 18x\ (x^2 + 8)^8$

Page 109, #19: $y = (4x^3 - 7)^{-6}\ , \quad y' = -72x^2\ (4x^3 - 7)^{-7}$

Page 109, #20: $y = (x^2 + 3x - 7)^{-5}\ , \quad y' = -5\ (x^2 + 3x - 7)^{-6}\ (2x + 3)$

Page 109, #21: $y = [\cos(x^2 + 3)]^{100}, \quad y' = -200x\ [\cos(x^2 + 3)]^{99}\ \sin(x^2 + 3)$

Page 109, #22: $y = [\cos(5x + 3)^4]^5, \quad y' = -100\ [\cos(5x + 3)^4]^4\ \cos(5x + 3)^3\ \sin(5x + 3)$