MATH 149 SOLUTIONS TO HOMEWORK 8

Section 2.4 # 10. $f(t) = (9t+2)^{2/3} \Rightarrow f'(t) = \frac{2}{3}(9t+2)^{-1/3} \cdot 9 = \frac{6}{\sqrt[3]{9t+2}}$

#14. $g(x) = \sqrt{x^2-2x+1} \Rightarrow g'(x) = \frac{1}{2\sqrt{x^2-2x+1}} \cdot (2x-2) = \frac{2(x-1)}{2(x-1)} = 1$ think about why!

#32. $g(x) = \left(\frac{3x^2-2}{2x+3}\right)^3 \Rightarrow g'(x) = 3\left(\frac{3x^2-2}{2x+3}\right)^2 \cdot \left(\frac{6x(2x+3) - (3x^2-2)\cdot 2}{(2x+3)^2}\right)$

$= \frac{3(3x^2-2)^2 \cdot (6x^2+18x+4)}{(2x+3)^4}$

#42. $y = \sin(\pi x) \Rightarrow y' = \cos(\pi x) \cdot \pi$

#56. $y = 3x - 5\cos(\pi x)^2$

$y' = 3 + 5\sin(\pi x)^2 \cdot 2(\pi x) \cdot \pi = 3 + 10\pi^2 \times \sin(\pi x)^2$

#58. $y = \sin\sqrt[3]{x} + \sqrt[3]{\sin x} = \sin x^{1/3} + (\sin x)^{1/3}$

$y' = \cos(x^{1/3}) \cdot \frac{1}{3}x^{-2/3} + \frac{1}{3}(\sin x)^{-2/3} \cdot \cos x$

$= \frac{1}{3}\left(\frac{\cos\sqrt[3]{x}}{x^{2/3}} + \frac{\cos x}{(\sin x)^{2/3}}\right)$

#62. $f(x) = \frac{1}{(x^2-3x)^2} \Rightarrow f'(x) = -\frac{1}{(x^2-3x)^4} \cdot 2(x^2-3x)\cdot(2x-3)$

at $x=4$, $f'(4) = \frac{-1}{4^4} \cdot 2 \cdot 4 \cdot 5 = \frac{-10}{64}$

#98.

		−2	−1	0	1	2	3
a) $g(x) = f(x) - 2 \Rightarrow g'(x) = f'(x)$	g'	4	2/3	−1/3	−1	−2	−3
b) $h(x) = 2 \cdot f(x) \Rightarrow h'(x) = 2f(x)$	h'	8	4/3	−2/3	−2	−4	−6
c) $r(x) = f(-3x) \Rightarrow r'(x) = f'(-3x) \cdot -3$	r'	$-3f'(6)$	$-3f'(3)$	$-3f'(0)$	$-3f'(-3)$	$-3f'(-6)$	$-3f'(-9)$
d) $s(x) = f(x+2) \Rightarrow s'(x) = f'(x+2) \cdot 1$	s'	$f'(0)$ −4/3	$f'(1)$ −1	$f'(2)$ −2	$f'(3)$ −3	$f'(4)$	$f'(5)$

#102. Displacement from equilibrium $= y = \frac{1}{3}\cos(12t) - \frac{1}{4}\sin(12t)$

Velocity $= y' = \frac{1}{3}(-\sin(12t)) \cdot 12 - \frac{1}{4}\cos(12t) \cdot 12$

$= -4\sin(12t) - 3\cos(12t)$

When $t = \frac{\pi}{4}$, displacement $= y(\frac{\pi}{8}) = \frac{1}{3}\cos(\frac{3\pi}{2}) - \frac{1}{4}\sin(\frac{3\pi}{2})$

$= \frac{1}{3}(0) - \frac{1}{4}\cdot(-1) = \frac{1}{4}$ feet.

velocity $= y'(\frac{\pi}{8}) = -4\sin(\frac{3\pi}{2}) - 3\cos(\frac{3\pi}{2})$

$= -4(-1) - 3\cdot 0 = 4$ feet/second