Saturday Review Chapter 2

Demo Problems

① Find $f'(x)$ as a limit, show all work

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

b) $f(x) = \sqrt{x+5}$

② Find the average rate of change of $f(x) = 3\sin x + 1$ on $\left[\frac{\pi}{6}, \frac{\pi}{2}\right]$

③ $y = 5x + \frac{3}{x^2} - 8x^5 + \sin x$ find y''

④ $y = \tan^3(\cos(3x))$ find y'

⑤ $y = (x-1)^3(x^2-4x+6)^2$ Find the tangent line at $x = 2$

⑥ $y = x^2 - x - 17$ Find the tangent lines at the points where the graph intersects $y = x - 2$.

⑦

x	$g(x)$	$h(x)$	$g'(x)$	$h'(x)$
3	5	-3	6	-2
4	2	3	-1	4

a) $f(x) = g(x)h(x)$ find $f'(3)$

b) $f(x) = (g(x))^3$ find $f'(4)$

c) $f(x) = g(h(x))$ find $f'(4)$

(8) $$f(x) = \begin{cases} -x^2 + 5x - 5 & \text{if } x \leq 3 \\ \sqrt{2x-5} & \text{if } x > 3 \end{cases}$$

Is $f(x)$ differentiable at $x = 3$? Show all work.

(9) $$f(x) = |x^2 - 2x - 8|$$

a) write $f(x)$ as a piecewise function

b) write $f'(x)$ as a piecewise function

c) Is $f(x)$ differentiable at $x = 4$? Show work

(10) Find $$\lim_{h \to 0} \frac{\cos\left(\frac{5\pi}{6} + h\right) + \frac{\sqrt{3}}{2}}{h}$$

(11) Find values of m and k to make $f(x)$ differentiable

$$f(x) = \begin{cases} kx^2 - 3x + 4 & \text{if } x \leq 4 \\ m\sqrt{x+5} & \text{if } x > 4 \end{cases}$$

Practice Problems

(1) Find $f'(x)$ as a limit. Show all work $f(x) = \frac{1}{2x-5}$

(2) $y = \cos^4\left(\frac{2}{3x-5}\right)$ find y'

(3) $y = \frac{3}{x^3} - 6x^2 + 5x^4 + \tan x$ find y''

(4) $y = \frac{x^2 - 3x}{\sin x}$ find $\left.\frac{dy}{dx}\right|_{x=\frac{\pi}{2}}$

(5)

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
0	3	5	-2	6
1	0	4	8	-1

a. $h(x) = g(f(x))$ Find $h'(1)$

b) $h(x) = f(x^2)$ Find $h'(1)$

c) $h(x) = \frac{g(x)}{f(x)}$ Find $h'(0)$

(6) $f(x) = \sqrt{2x^2 - 6x + 9}$ Find the tangent line at $x = 3$

(7) $f(x) = x^2 + 3x - 18$. Find the tangent lines where $f(x)$ crosses the x-axis

(8) Find $\lim_{h \to 0} \frac{\tan\left(\frac{\pi}{3} + h\right) - \sqrt{3}}{h}$

(9) Find values of a and b to make $f(x)$ differentiable

$$f(x) = \begin{cases} 3ax + 5 & \text{if } x \leq 1 \\ bx^2 - 2x & \text{if } x > 1 \end{cases}$$