Differentiability & Continuity Stations Name Key

D

1. $f'(x) = \lim_{h\to 0} \frac{(x+h)^3 - 2(x+h) + (x^3 - 2x)}{h}$

$= \lim_{h\to 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3 - 2x - 2h - x^3 + 2x}{h}$

$= \lim_{h\to 0} \frac{h(3x^2 + 3xh + h^2 - 2)}{h} \Rightarrow f'(x) = 3x^2 - 2$

E_1

2. $\lim_{x\to 1^-} \frac{f(x) - f(1)}{x-1} \Rightarrow \frac{x-1}{x-1} \Rightarrow 1$

$\lim_{x\to 1^+} \frac{f(x) - f(1)}{x-1} \Rightarrow \frac{x^2-1}{x-1} \Rightarrow \frac{(x+1)(x-1)}{(x-1)} \Rightarrow x+1 \Rightarrow 2$

$\therefore f(x)$ is not differentiable at $x=1$, limits are different

R

3A. all x-values except $x=-1$, $x=0$, and $x=2$

3B. $x=-1$

3C. $x=0$; $x=2$

I_1

4A. $y' = 3x^2 - 8x + 5 = 0$

$(3x-5)(x-1)=0$

$x = 5/3 \quad x=1$

4B. $3x^2 - 8x + 5 = 5$ $\quad m = \frac{10}{2}$

$3x^2 - 8x = 0$

$x(3x-8)=0$

$x=0 \quad x=8/3$

V

5A. $2x - k = 4 \Rightarrow k = 2x - 4$

$x^2 - (2x-4)x = 4x - 9$

$x^2 - 2x^2 + 4x = 4x - 9$

$x^2 = 9$

$x=3;\ k=2 \quad x=-3;\ k=-10$

5B. $\frac{k}{2\sqrt{x}} = 1 \Rightarrow k = 2\sqrt{x}$

$(2\sqrt{x})(\sqrt{x}) = x+4$

$2x = x+4$

$x=4$

$x=4;\ k=4$

A

6A. $ARoC = \frac{s(2) - s(1)}{2-1}$

$= \frac{9-0}{1}$

$V_{avg} = 9$ ft/sec

6B. $IROC \Rightarrow v(t) = s'(t)$

$v(t) = 3t^2 + 2t - 1$

$v(1) = 3 + 2 - 1$

$v(1) = 4$ ft/sec

Jean Adams

T	7A. $f'(x)=\frac{3}{4x^{3/4}}$	7B. $y'=\frac{-2}{x^2}+4\sin x$
	7C. $g'(x)=\frac{2}{\sqrt{x}}-\frac{3}{\sqrt[3]{x^2}}$	7D. $h'(x)=\frac{-2}{x^{4/3}}-3\sin x$
I_2	8A. $g'(x)=3x^2\cos x-x^3\sin x$	8B. $f'(x)=\sqrt{x}\cos x+\frac{\sin x}{2\sqrt{x}}$
	8C. $h'(t)=t^2\cos t+2t\sin t$	8D. $f'(\theta)=(3\tan\theta)(2\theta-\frac{1}{\sqrt{\theta}})+(\theta^2-2\sqrt{\theta})(3\sec^2\theta)$
V	9A. $f'(x)=\frac{x\cos x-2\sin x}{x3}$	9B. $g'(x)=\frac{\sqrt{x}-4}{2(\sqrt{x}-2)^2}$
	9C. $h'(x)=\frac{-2(x^2-5x-3)}{(x^2+3)^2}$	9D. $f'(x)=\frac{x^4-8x^2-6x-5}{(x^2-1)^2}$
E_2	10A. $y'=6(2x-7)^2$	10B. $f'(x)=\frac{-4x}{3\sqrt[3]{9-x^2}}$
	10C. $y'=12\sec^2 4x$	10D. $g'(\theta)=\sin 2\theta\cos 2\theta$
S	11A. $h=f(g(x))$ $h'(x)=f'(g(x)\cdot g'(x)$ $h'(1)=f'(g(1))\cdot g'(1)$ $h'(1)=f'(3)(3)$ $h'(1)\approx(1)(3)$ $h'(1)=3$	11B. $h=f(g(x))$ $h'(x)=f'(g(x))\cdot g'(x)$ $h'(0)=f'g(0)\cdot g'(0)$ $=f'(0)\cdot(3)$ $\approx-\frac{1}{2}(3)$ $h'(0)=-3/2$	11C. no $f'(g(2))\cdot g'(2)$ $f'(6)\cdot dne$ $\frac{1}{4}\cdot dne$

Jean Adams