Bridges Math 122B Name Key

## PRODUCT RULE AND QUOTIENT RULE

| $x$ | $f(x)$ | $g(x)$ | $f'(x)$ | $g'(x)$ | $f''(x)$ | $g''(x)$ |
|---|---|---|---|---|---|---|
| $-4$ | 2 | $-1$ | 6 | 4 | 0 | 7 |
| 3 | $-3$ | $-4$ | $-2$ | 5 | $-1$ | $-6$ |

4 TOTAL

4
3 TRY IT
3 TRY IT

**#1)** Let $h(x) = f(x) \cdot g(x)$

(a) $h'(x)$ $h'(x) = f'(x) \cdot g(x) + g'(x) \cdot f(x)$

(i) What is $h'(x)$

(ii) What is the value of $h'(3)$. CLEARLY SHOW ALL WORK.

$h'(3) = f'(3) \cdot g(3) + g'(3) \cdot f(3)$

$h'(3) = -2(-4) + 5(-3) = 8 - 15 = \boxed{-7}$

-14 C

(iii) Is $h(x)$ increasing or decreasing at $x = 3$? IN A COMPLETE SENTENCE, STATE YOUR REASON.

$h(x)$ IS DECREASING AT $x=3$ SINCE $h'(-3) < 0$

(b) $h''(x)$

(i) What is $h''(x)$

$h''(x) = f''(x) \cdot g(x) + g'(x) \cdot f'(x) + g''(x) \cdot f(x) + f'(x) \cdot g'(x)$ (all at $x=-4$)

(ii) What is the value of $h''(-4)$. CLEARLY SHOW ALL WORK.

$h''(-4) = 0(-1) + 4 \cdot 6 + 7 \cdot 2 + 6 \cdot 4$

$= 0 + 24 + 14 + 24$

$= \boxed{62}$

(iii) Is $h(x)$ concave up or concave down at $x = -4$? IN A COMPLETE SENTENCE, STATE YOUR REASON.

$h(x)$ is concave up at $x=-4$ since $h''(-4) > 0$

| $x$ | $f(x)$ | $g(x)$ | $f'(x)$ | $g'(x)$ | $f''(x)$ | $g''(x)$ |
|---|---|---|---|---|---|---|
| –4 | 2 | –1 | 6 | 4 | 0 | 7 |
| 3 | –3 | –4 | –2 | 5 | –1 | –6 |

**#2)** Let $k(x) = \frac{f(x)}{g(x)}$

(a) $k'(x)$

(i) What is $k'(x) = \dfrac{f'(x)\cdot g(x) - g'(x)\cdot f(x)}{(g(x))^2}$

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(ii) What is the value of $k'(-4)$. CLEARLY SHOW ALL WORK.

$$k'(-4) = \frac{6(-1) - 4(2)}{(-1)^2}$$

$$= \frac{-6-8}{1} = -14$$

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(iii) Is $k(x)$ increasing or decreasing at $x = -4$? IN A COMPLETE SENTENCE, STATE YOUR REASON.

K is decreasing since $k'(-4) < 0$

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(b) $k''(x)$

EXTRA CREDIT

(i) What is $k''(x)$

SEE ATTACHED PAPER

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(ii) What is the value of $k''(-4)$. CLEARLY SHOW ALL WORK.

$$k''(-4) = 30$$

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(iii) Is $k(x)$ concave up or concave down at $x = -4$? IN A COMPLETE SENTENCE, STATE YOUR REASON.

CONCAVE UP