Derivative Rules: Level 1

Analytical

$$f(x) = x^2\cos(x)$$

$$f'(x) = x^2[-\sin(x)] + 2x \cdot \cos(x)$$

$$f'(x) = -x^2\sin(x) + 2x\cos(x)$$

Numerical

x	-1	1
$k(x)$	-3	2
$k'(x)$	4	-5

$$h(x) = \frac{k(x)}{3x}$$

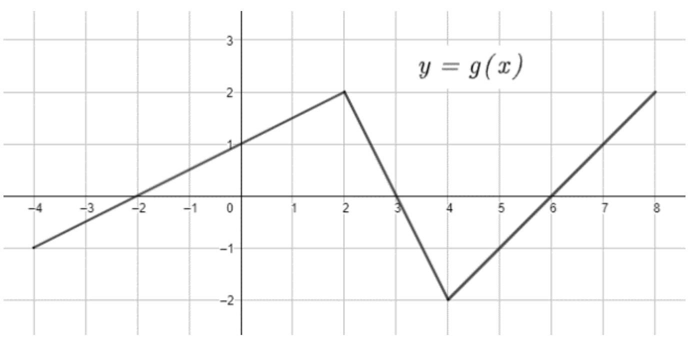
$$h'(-1) = \frac{k'(x)\cdot 3x - 3\cdot k(x)}{(3x)^2}$$

$$h'(x) = \frac{3x\cdot k'(x) - 3\cdot k(x)}{9x^2} = \frac{\cancel{3}\left(xk'(x) - k(x)\right)}{\cancel{3}\cdot 3x^2}$$

$$h(-1) = \frac{-1\cdot k'(-1) - k(-1)}{3(-1)^2}$$

$$= \frac{-1k'(-1) - k(-1)}{3(1)} = \frac{-1(4) - (-3)}{3} = -\frac{1}{3}$$

Graphical



$$p(x) = 5x\cdot g(x)$$

$$p'(3) =$$

$$p'(x) = 5x\cdot g'(x) + 5\cdot g(x)$$

$$p'(3) = 5(3)\cdot g'(3) + 5\cdot g(3)$$

$$p'(3) = 15(-2) + 5(0) = -30$$

Conceptual/Verbal

$$g(x) = e^x$$

$$f(x) = 3g(x) - x^2 + 3$$

$$f'(2) =$$

$$f'(x) = 3g'(x) - 2x + 0 \qquad g'(x) = e^x$$

$$f'(2) = 3g'(2) - 2(2)$$

$$f'(2) = 3e^2 - 4$$