

Please show **all** your work! Answers without supporting work will not be given credit.  
Write answers in spaces provided.

Name: \_\_\_\_\_

1. Find the derivative of the following functions:

(a) [2 pts]  $u(x) = 3e^x$

(b) [2 pts]  $v(x) = 2 \cos(x)$

**Solution:** Recall that

$$\frac{d}{dx}(e^x) = e^x$$

So  $u'(x) = 3e^x$

**Solution:** Recall that

$$\frac{d}{dx}(\cos x) = -\sin x$$

So  $v'(x) = -2 \sin x$

(c) [2 pts]  $w(x) = \frac{2}{x^2} + 4x^2 + 6x + 1$

**Solution:** Rewrite  $w(x)$  to not have any fractions. i.e.

$$w(x) = 2x^{-2} + 4x^2 + 6x + 1$$

By Power Rule,  $w'(x) = -4x^{-3} + 8x + 6 = \frac{-4}{x^3} + 8x + 6$

2. [4 points] Let  $h(x) = u(x) \cdot w(x)$ . Find  $h'(x)$ . (**Don't Simplify.**)

**Solution:** Recall that when  $h(x) = u(x) \cdot w(x)$ , we use Product Rule, which states

$$h'(x) = u'(x)w(x) + u(x)w'(x)$$

Using part (a) and (c), we get

$$\begin{aligned} h'(x) &= \span style="border: 1px solid red; padding: 2px;"> $3e^x \left( \frac{2}{x^2} + 4x^2 + 6x + 1 \right) + 3e^x \left( \frac{-4}{x^3} + 8x + 6 \right)$  \\ &= 3e^x \left( \frac{2}{x^2} + 4x^2 + 6x + 1 + \frac{-4}{x^3} + 8x + 6 \right) \\ &= 3e^x \left( \frac{-4}{x^3} + \frac{2}{x^2} + 4x^2 + 14x + 7 \right) \end{aligned}$$