

Compute the following derivatives, using the standard differentiation rules. If there are places where the derivative is not defined, mention them.

1.

$$a(x) = 3x^2 - 6x - x^{-1}$$

$$a'(x) = 6x^{2-1} - 6x^{1-1} + x^{-1-1} \quad \leftarrow \text{power rule}$$

$$a'(x) = 6x - 6 + x^{-2}$$

it is not defined when  $x=0$

2.

$$b(x) = \frac{\sin(x)}{\cos(x)}$$

$$f = \sin(x) \quad g = \cos(x)$$

$$f' = \cos(x) \quad g' = -\sin(x)$$

$$\frac{\cos(x)^2 - \sin(x)(-\sin(x))}{\cos(x)^2}$$

$$\frac{\cos(x)^2 + \sin(x)^2}{\cos(x)^2} = \frac{1}{\cos(x)^2} = \sec(x)^2$$

good



1

undefined where  $\cos(x) = 0$   
so at  $\frac{\pi}{2}$  and  $\frac{3\pi}{2}$ , and so on.

3.

Product Rule

$$[f(x) \cdot g(x)]$$

↓

$$[f(x)g'(x) + g(x)f'(x)]$$

$$c(x) = \frac{5e^x \cos(x)}{f \quad g}$$

$$f = 5e^x \quad g = \cos x$$

$$f' = 5e^x \quad g' = -\sin x$$

$$c'(x) = (5e^x)(-\sin x) + (5e^x)(\cos x)$$

$$c'(x) \rightarrow -5e^x(\sin x) + 5e^x(\cos x)$$

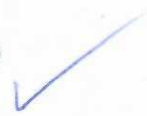
$$= 5e^x (\cos(x) - \sin(x))$$

factor when you  
can!

$$c(x) = 5e^x \cos(x)$$

$$c'(x) = 5e^x(\cos x) + 5e^x(-\sin x)$$
$$= 5e^x(\cos x - \sin x)$$

product  
rule



4.

$$d(x) = (3x - 2)^2 = 9x^2 - 12x + 4$$

power rule  $\rightarrow$

$$d'(x) = 18x - 12$$

or  $d'(x) = 2(3x - 2) \cdot 3$

(chain  
rule)

$$= 6(3x - 2)$$

$$= 18x - 12$$

✓ better -

factor when  
you can.