

Name: Solutions

Please take your time and answer each question clearly and carefully. For this quiz, you will not need a calculator. Do not use one.

1. Find the derivative of each of the following functions. Be sure to carefully apply the appropriate rules for products, exponents, powers, etc.

(a) $P(t) = 10000e^{6t}$

$$P'(t) = \boxed{60000 e^{6t}}$$

$$e^t \mapsto e^t$$

$$e^{kt} \mapsto ke^{kt}$$

(b) $f(q) = \underbrace{q^2 \cos(q)}_{\text{product}} + \underbrace{2q + 1}_{\text{line, slope 2}}$

$$f = q^2$$

$$g = \cos(q)$$

$$f' = 2q$$

$$g' = -\sin(q)$$

$$f'(q) = \boxed{2q \cos(q) - q^2 \sin(q) + 2}$$

$f'g + fg'$

(c) $g(x) = 8x^{5/4} + \underbrace{x \ln(x)}_{\text{product}}$

$$x^n \mapsto nx^{n-1}$$

$$\ln(x) \mapsto \frac{1}{x}$$

$$g'(x) = 8\left(\frac{5}{4}x^{1/4}\right) + \left(\underbrace{x}_{f} \cdot \underbrace{\frac{1}{x}}_{g'} + \underbrace{1}_{f'} \cdot \underbrace{\ln(x)}_g\right)$$

$$= \boxed{10x^{1/4} + 1 + \ln(x)}$$

TURN OVER

2. Compute the derivative of the following function. You will need to use the chain rule.

$$F(x) = 7e^{\sin(x)} + \cos(x^2 + 7x + 1)$$

Recall

$$f(g(x))$$



$$f'(g(x)) \cdot g'(x)$$

$$f(x) = 7e^x$$

$$f'(x) = 7e^x$$

$$g(x) = \sin(x)$$

$$g'(x) = \cos(x)$$

$$f(g(x)) = 7e^{\sin(x)}$$

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

$$f'(x) = -\sin(x)$$

$$g(x) = x^2 + 7x + 1$$

$$g'(x) = 2x + 7$$

$$f(g(x)) = -\sin(x^2 + 7x + 1)$$

Summary:

$$7e^{\sin(x)} \mapsto 7e^{\sin(x)} \cdot \cos(x)$$

$$\cos(x^2 + 7x + 1) \mapsto -\sin(x^2 + 7x + 1) \cdot (2x + 7)$$

$$F'(x) = 7e^{\sin(x)} \cos(x) - (2x + 7) \sin(x^2 + 7x + 1)$$