

Solve:

1) Given $u(x) = 2x^4 e^x$.

What is $\frac{d^2 u}{dx^2}$?

$$u'(x) = 2x^4 \cdot e^x + 8x^3 \cdot e^x$$

$$u''(x) = 2x^4 e^x + 8x^3 e^x + 8x^3 e^x + 24x^2 e^x$$
$$= \boxed{2x^4 e^x + 16x^3 e^x + 24x^2 e^x}$$

2) Given $h(x) = -x^4 + 2x^3 - 4x^2$. What is $h''(1)$?

$$h'(x) = -4x^3 + 6x^2 - 8x$$

$$h''(x) = -12x^2 + 12x - 8$$

$$h''(1) = \boxed{-8}$$

3) Given $q(x) = -5x^3 - x^2 + 3x + 5$. What is $q''(2)$?

$$q'(x) = -15x^2 - 2x + 3$$

$$q''(x) = -30x - 2$$

$$q''(2) = \boxed{-62}$$

4) Given $k(x) = 4x^3 - 4x - 5$.

What is $\frac{d^2 k}{dx^2}$?

$$k'(x) = 12x^2 - 4$$

$$k''(x) = \boxed{24x}$$

5) What is the double derivative of

$$v(x) = -5x^2 \sin x?$$

$$v'(x) = -5x^2 \cdot \cos x - 10x \cdot \sin x$$

$$v''(x) = 5x^2 \cdot \sin x - 10x \cdot \cos x - (10x \cdot \cos x + 10 \sin x)$$
$$= \boxed{5x^2 \cdot \sin x - 20x \cdot \cos x - 10 \sin x}$$

6) What is the double derivative of

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

$$c'(x) = -x^5 \cdot \sin x + 5x^4 \cdot \cos x$$

$$c''(x) = -x^5 \cdot \cos x - 5x^4 \cdot \sin x - 5x^4 \cdot \sin x + 20x^3 \cdot \cos x$$

$$= \boxed{-x^5 \cdot \cos x - 10x^4 \cdot \sin x + 20x^3 \cdot \cos x}$$

7) Find the equation of the tangent line to the graph of $u(x) = x + 4$ at $x = 2$.

$$u'(x) = 1 \quad (2, 6)$$

$$6 = 1 \cdot 2 + b$$

$$b = 4$$

$$\boxed{y = x + 4}$$

8) Find the equation of the tangent line to the graph of $b(x) = -3x + 3$ at $x = -1$.

$$b'(x) = -3 \quad (-1, 6)$$

$$6 = -3(-1) + b$$

$$b = 3$$

$$\boxed{y = -3x + 3}$$

9) Find the equation of the tangent line to the graph of $r(x) = -4x^2 - 3x + 4$ at $x = 0$.

$$r'(x) = -8x - 3$$

$$r'(0) = -3$$

$$(0, 4)$$

$$4 = -3 \cdot 0 + b$$

$$b = 4$$

$$\boxed{y = -3x + 4}$$

10) Find the equation of the tangent line to the graph of $q(x) = 4x^4 - 4x^3 + 4x^2 - 2x + 2$ at $x = -2$.

$$q'(x) = 16x^3 - 12x^2 + 8x - 2$$

$$q'(-2) = -194 \quad (-2, 118)$$

$$118 = -194 \cdot (-2) + b$$

$$b = -270$$

$$\boxed{y = -194x - 270}$$

11) Find the equation of the tangent line to the graph of $d(x) = -3x^4 - 5x^3 - 5x^2 + 3x + 5$ at $x = 2$.

$$d'(x) = -12x^3 - 15x^2 - 10x + 3$$

$$d'(2) = -173 \quad (2, -97)$$

$$-97 = -173 \cdot 2 + b$$

$$b = 249$$

$$y = -173x + 249$$

12) Find the equation of the tangent line to the graph of $r(x) = -4x + 3$ at $x = -1$.

$$r'(x) = -4 \quad (-1, 7)$$

$$7 = -4(-1) + b$$

$$b = 3$$

$$y = -4x + 3$$