IB Math SL Name_____ ID: 1

Derivative Review

For each problem, find the following values

1) Find the derivative of
$f(x) = -x^3 + 2x^2 + 4$ at $x = 2$

$f'(x) = -3x^2 + 4x$
$f'(2) = -4$

2) Find the slope of
$f(x) = -x^2 - 6x - 5$ at $x = 0$

$f'(x) = -2x - 6$
$f'(0) = -6$

For each problem, find the equation of the line tangent or normal to the function at the given point. Your answer should be in slope-intercept form.

3) Tangent line of
$f(x) = -x^3 + 2x^2 - 3$ at $(2, -3)$

$f'(x) = -3x^2 + 4x$
m=$f'(2) = -4$
$y - -3 = -4(x - 2)$
$y = -4x + 5$

4) Normal line of
$f(x) = -x^2 - 4x - 3$ at $(-3, 0)$

$f'(x) = -2x - 4$
m=$f'(-3) = 2$
normal slope = $-\frac{1}{2}$
$y - 0 = -\frac{1}{2}(x - -3)$
$y = -\frac{1}{2}x - \frac{3}{2}$

For each problem, find the following

5) Find the point(s) where the slope of
$f(x) = x^3 - 3x^2 - 1$ equals 0.

$f'(x) = 3x^2 - 6x$
$3x^2 - 6x = 0$
$3x(x - 2) = 0$
$x = 0$ and $x = 2$
$f(0) = -1$ and $f(2) = -5$
$(0, -1), (2, -5)$

6) Find the point(s) where the slope of
$f(x) = 2x^2 - 3x + 4$ equals 5.

$f'(x) = 4x - 3$
$4x - 3 = 5$
$x = 2$
$f(2) = 6$
$(2, 6)$

Differentiate each function with respect to x.

7) $f(x) = 3x^5 + 2x^2 + 1$

$f'(x) = 15x^4 + 4x$

8) $f(x) = -3x^4 + 4x + 10\sqrt{x}$

$f'(x) = -12x^3 + 4 + \frac{5}{x^{\frac{1}{2}}}$

9) $f(x) = 2x^5 + 3x^2 + 6\sqrt[3]{x}$

$f'(x) = 10x^4 + 6x + \dfrac{2}{x^{\frac{2}{3}}}$

10) $f(x) = 3x + \dfrac{4}{x} - \dfrac{3}{x^2}$

$f'(x) = 3 - \dfrac{4}{x^2} + \dfrac{6}{x^3}$

For each problem, find the indicated derivative with respect to x.

11) $f(x) = 2x^5 - 5x^4 - x^2 + 3x$ Find f''

$f'(x) = 10x^4 - 20x^3 - 2x + 3$
$f''(x) = 40x^3 - 60x^2 - 2$

12) $f(x) = \dfrac{3}{x^5} + 4e^x$ Find f''

$f'(x) = -\dfrac{15}{x^6} + 4e^x$

$f''(x) = \dfrac{90}{x^7} + 4e^x$

Differentiate each function with respect to x.

13) $f(x) = -3x^4(-5x^5 + 2)$

$f'(x) = -3x^4 \cdot -25x^4 + (-5x^5 + 2) \cdot -12x^3$
$= 135x^8 - 24x^3$

14) $f(x) = (2x^4 + 4)(-2x^4 + x^2 + 2)$

$f'(x) = (2x^4 + 4)(-8x^3 + 2x) + (-2x^4 + x^2 + 2) \cdot 8x^3$
$= -32x^7 + 12x^5 - 16x^3 + 8x$

15) $f(x) = \dfrac{4x^5}{3x^2 + 3}$

$$f'(x) = \frac{(3x^2 + 3) \cdot 20x^4 - 4x^5 \cdot 6x}{(3x^2 + 3)^2}$$
$$= \frac{40x^6 + 60x^4}{(3x^2 + 3)^2}$$

16) $f(x) = \dfrac{5x^2 + 5}{2x^4 - 3}$

$$f'(x) = \frac{(2x^4 - 3) \cdot 10x - (5x^2 + 5) \cdot 8x^3}{(2x^4 - 3)^2}$$
$$= \frac{-20x^5 - 40x^3 - 30x}{(2x^4 - 3)^2}$$

17) $f(x) = (-4x^4 + 3)^4$

$$f'(x) = 4(-4x^4 + 3)^3 \cdot -16x^3$$
$$= -64x^3(-4x^4 + 3)^3$$

18) $f(x) = (3x + 2)^2$

$$f'(x) = 2(3x + 2) \cdot 3$$
$$= 6(3x + 2)$$

19) $f(x) = e^{2x^4}$

$$f'(x) = e^{2x^4} \cdot 8x^3$$

20) $f(x) = \ln 2x^5$

$$f'(x) = \frac{1}{2x^5} \cdot 10x^4$$
$$= \frac{5}{x}$$

21) $f(x) = \sin 5x^2$

$$f'(x) = \cos 5x^2 \cdot 10x$$
$$= 10x\cos 5x^2$$

22) $f(x) = 2\tan 5x$

$$f'(x) = 2 \cdot \frac{1}{\cos^2 5x} \cdot 5$$
$$= \frac{10}{\cos^2 5x}$$

23) $f(x) = e^{3x}\cos 5x^3$

$$f'(x) = e^{3x} \cdot -1\sin 5x^3 \cdot 15x^2 + \cos 5x^3 \cdot e^{3x} \cdot 3$$
$$= 3e^{3x}(-5x^2\sin 5x^3 + \cos 5x^3)$$