

1st Semester Final Study Guide

Date _____ Period _____

Evaluate each limit.

1) $\lim_{x \rightarrow -1} \frac{x^2 + 5x + 4}{x + 1}$

2) $\lim_{w \rightarrow 3} h(w), h(w) = \begin{cases} -w^2 + 2w, & w \neq 3 \\ -2, & w = 3 \end{cases}$

3) $\lim_{x \rightarrow 2} -\frac{x - 4}{x^2 - 6x + 8}$

4) $\lim_{s \rightarrow 4} -\frac{s^2}{4s - 16}$

5) $\lim_{t \rightarrow -\infty} (t^5 - 4t^3 + 2t + 1)$

For each problem, find the equation of the tangent line to the function at the given point.

6) $t = \frac{1}{x - 1}; \left(-3, -\frac{1}{4}\right)$

7) $y = t^2 + t + 1; (-2, 3)$

8) $f = -2t^2 - 2t - 2; (-2, -6)$

Differentiate each function with respect to x .

9) $y = \frac{14}{3}x^5 - 10x^3 - 7\sqrt[4]{x}$

10) $y = \frac{1}{5}x^3 + 7\sqrt[3]{x}$

$$11) y = -\frac{11}{9} \sqrt[4]{x}$$

$$12) y = 4x^{\frac{2}{3}}$$

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

$$13) h = -7t^3 - \frac{9}{t} + \frac{1}{t^2} \quad \text{Find } \frac{d^2h}{dt^2}$$

$$14) r = -2s^{\frac{3}{4}} - 9\sqrt[5]{s^2} \quad \text{Find } \frac{d^2r}{ds^2}$$

$$15) r = 2s^{\frac{5}{4}} - \frac{2}{s^3} \quad \text{Find } \frac{d^2r}{ds^2}$$

Differentiate each function with respect to the given variable.

$$16) s = -10t^4(-5t^3 - 3)$$

$$17) g = (2t^2 - 8) \cdot -2t^3$$

$$18) g(t) = 7t^5(10t^3 + 5)$$

Differentiate each function with respect to x .

$$19) f(x) = \frac{9x^5 + 1}{7x^3 - 6}$$

$$20) y = \frac{4x^5 - 4x^2}{7x^2 - 9}$$

$$21) f(x) = \csc \frac{7x^4}{x^5 + 7}$$

$$22) f(x) = \tan 9x^2 \cdot (x^4 + 7)$$

$$23) f(x) = \frac{-2x^5 - 7}{\cot 10x^2}$$

$$24) f(x) = \sin 2x^5 \cdot (8x^2 - 7)$$

$$25) f(x) = \frac{x^3 - 7}{(8x^4 - 5)^{-2}}$$

$$26) f(x) = \left(\frac{9x - 10}{-9x^4 + 2} \right)^{\frac{1}{5}}$$

For each problem, use implicit differentiation to find $\frac{dy}{dx}$ in terms of x and y .

$$27) 3x^2y^2 + 5y = 4x$$

$$28) 4x^3 + 4y = 3xy$$

$$29) 2x + 3y^2 = 5x^3y^2$$

$$30) 4y^2 + 5x^3y^2 = x^2$$