Name_____

Differentiate each function with respect to *x*.

1) $y = \left(-3x^2 + 5\right)^5$

2) $y = \left(5x^2 + 3\right)^{\frac{1}{2}}$

3) $y = \left(-2x^4 + 5\right)^{-3}$

4) $y = \sqrt{4x^2 + 1}$

5) $f(x) = (3x - 1)\left(4x^5 + 3\right)^2$

6) $y = \dfrac{\left(5x^3 + 1\right)^{-4}}{-x^5 + 4}$

7) $y = \left(\dfrac{-2x^5 - 3}{4x^3 - 1}\right)^2$

8) $y = \left((5x^5 + 2)^4 + 4\right)^5$

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

9) $1 = 3x^2 - 5y^3$

10) $2x^2 + 2y^2 + 5y = 3$

Write the equation of the tangent line through the given point.

11) $2 = 2x^3 - xy$ at $(-2, 9)$

Differentiate each function with respect to x.

12) $y = \sin 4x^3$

13) $y = (4\cos x)^{10}$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the velocity function $v(t)$ and the acceleration function $a(t)$.

14) $s(t) = -t^3 + 28t^2 - 196t$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the times t when the particle changes directions.

15) $s(t) = t^3 - 22t^2 + 121t$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the intervals of time when the particle is moving left and moving right.

16) $s(t) = t^3 - 26t^2 + 169t$

A particle moves along a horizontal line. Its velocity function is $v(t)$ for $t \geq 0$. For each problem, find the intervals of time when the particle is moving left and moving right.

17) $v(t) = 3t^2 - 16t$

A particle moves along a horizontal line. Its velocity function is $v(t)$ for $t \geq 0$. For each problem, find the intervals of time when the particle is slowing down and speeding up.

18) $v(t) = 3t^2 - 60t + 225$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the displacement of the particle and the distance traveled by the particle over the given interval.

19) $s(t) = t^3 - 13t^2 + 40t; \ 0 \leq t \leq 6$