

Find the derivative:

1) $y = (x^4 - 3x^2 + 5)^3$

2) $y = \cos(\tan x)$

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

4) $y = \left(x + \frac{1}{x^2}\right)^{\sqrt{7}}$

5) If $f(t) = \sqrt{4t+1}$ find $f''(2)$

6) If $g(\theta) = \theta \sin \theta$, find $g''(\pi/6)$

7) Find the equations of the tangent and normal lines to the curve at the point: (2, 1)

$$x^2 + 4xy + y^2 = 13$$

8) Find the points on the ellipse $x^2 + 2y^2 = 1$ where the tangent line has slope of 1.

9) A particle moves on a vertical line so that its coordinate at time t is $y = t^3 - 12t + 3, t \geq 0$.

- Find the velocity and acceleration functions.
- When is the particle moving upward and when is it moving downward?
- Find the distance that the particle travels in the time interval $[0, 3]$.
- Graph all three functions over the same time interval.
- When is the particle speeding up? Slowing down?

10) Find $f(x)$ if: $f'(x) = 8x - 3\sec^2 x$

11) Find $f(x)$ if: $f'(x) = 2x - 3\sin t$

12) Differentiate: $F(x) = \int_{2x}^{3x+1} \sin(t^4) dt$

13) Differentiate: $y = (\cos x)^x$

Integrate:

$$14) \int \sin \pi t \cos \pi t dt$$

$$15) \int_0^2 y^2 \sqrt{1+y^3} dy$$

$$16) \int \frac{1}{16+t^2} dt$$

$$17) \int \frac{\cos(\ln x)}{x} dx$$

$$18) \int \frac{x+1}{x^2+2x} dx$$

$$19) \int_0^1 \frac{e^x}{1+e^{2x}} dx$$

Find the area enclosed by the curves. Draw a picture! No calculators!

$$20) y = \sin x, y = 0, x = \pi/2, x = \pi$$

$$21) y = x^2 - 2x, y = x + 4$$

Find the volume of the solid rotated about the given line. Sketch all regions!! NO Calculators!

$$22) y = 4(x-2)^2, y = x^2 - 4x + 7, \text{ about the x-axis}$$

$$23) y^2 = x, x = 2y, \text{ about the y-axis}$$