

1 Differentiation

Find $\frac{dy}{dx}$ for each of the following:

- $y = x\sqrt{4x - x^2}$,

- $f(x) = (\cos(x))^2$

- $y = \sqrt{x + \frac{1}{x}}$

- $y = \sqrt{\tan(x)}$

- $y = \sin(x^3)$

- $y = \left[\frac{x^2 - 1}{x^2 + 1}\right]^2$

- $y = \frac{1}{x + \frac{1}{\sqrt{x}}}$

- $1 - xy^2 = y * x$

- $y = x \sin(y) + x$

- $y = 3x^2\sqrt{4 - x^2}$,

- $1 - xy = 2 \sin y$

- $f(x) = (\cos(x^2))(\sin(x^2))$

- $y = 3\sqrt{x} + \frac{1}{\sqrt{x}}$

- $y = \sin(2x)$

- $y = \sin(x^3)$

- $x^4 - y^3 - 3x^2 = 1$,

2 Find $\frac{d^2y}{dx^2}$

for the following:

- $x^2 + y^2 = 16$,
- $y = x \sin(x) + \cos(x)$
- $x^3 + y^3 = 1$,

3 local max/min and concave up/down

Determine where the following are

- increasing/decreasing,
- concave up/down
- and have local max/min.
- $f(x) = -4x^3 + 3x^2 + 18x + 1$
- $y = x + \sin(x)$ on the interval $[0, 2\pi]$.
- $y = 9x^4 + 8x^3 - 5$
- $f(x) = \frac{5x}{x+1}$
- $y = x^3 - 3x^2 + 3x$
- $f(x) = x^2 - 4$

4 Graphing

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