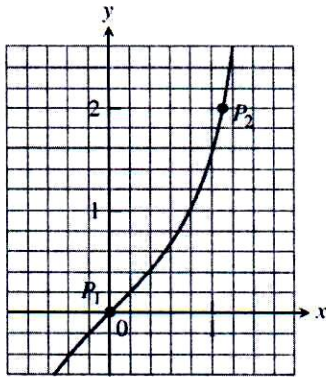# Derivative of Function of One Variable
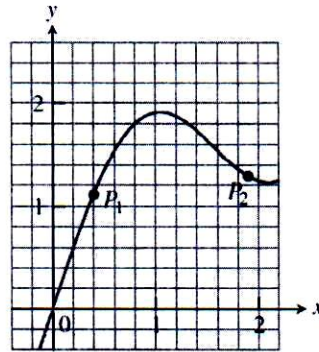
Slopes & Tangent Lines

Use the grid and a straight edge to make a rough estimate of the slope of the curve (in y–units per x–unit) at the points P_1 and P_2.
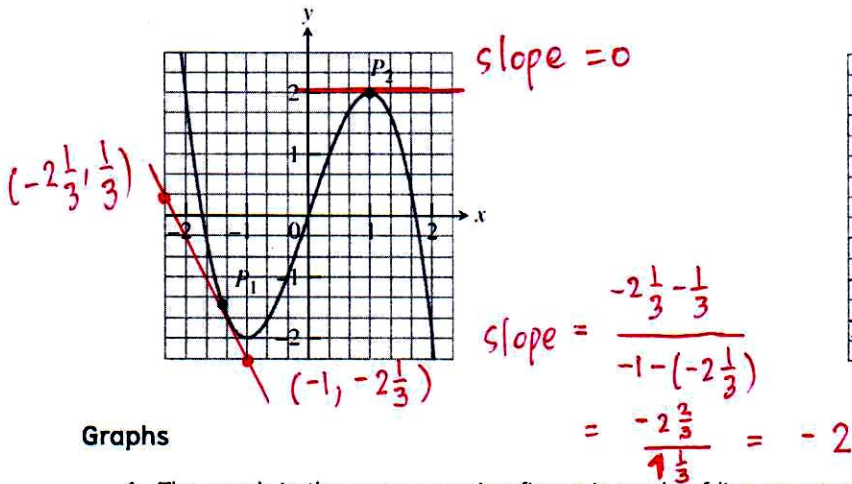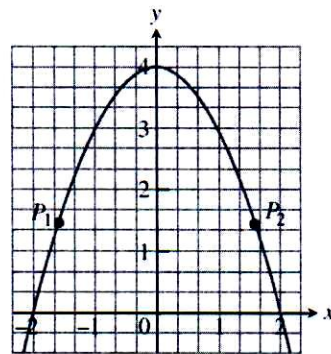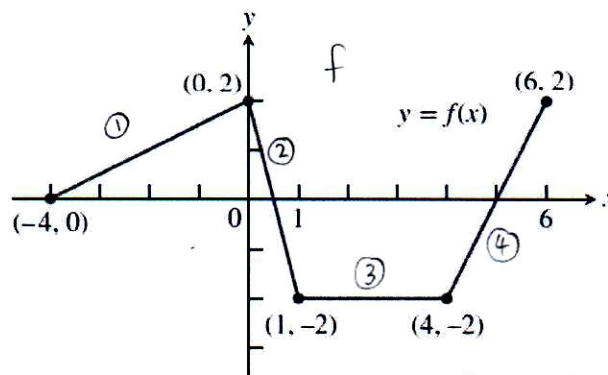
1.

3.

2.

$$(-2\tfrac{1}{3}, \tfrac{1}{3})$$

$$(-1, -2\tfrac{1}{3})$$

slope = 0

$$\text{slope} = \frac{-2\tfrac{1}{3} - \tfrac{1}{3}}{-1 - (-2\tfrac{1}{3})}$$

$$= \frac{-2\tfrac{2}{3}}{1\tfrac{1}{3}} = -2$$

4.

Graphs

1. The graph in the accompanying figure is made of line segments joined end to end.

① slope $= \dfrac{2-0}{0-(-4)} = \dfrac{1}{2}$

② slope $= \dfrac{-2-2}{1-0} = -4$

③ slope $= 0$

④ slope $= \dfrac{2-(-2)}{6-4} = 2$

(0, 2) f (6, 2)

$y = f(x)$

①

②

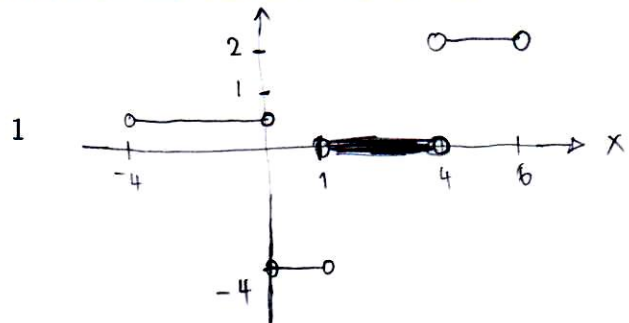(−4, 0)   0   1   6 x

③

④

(1, −2)   (4, −2)

f' is undefined at $x = -4, 0, 1, 4, 6$ because slope is undefined there.

1.1 At which points of the interval $[-4, 6]$ is f' not defined? Give reasons for your answer.
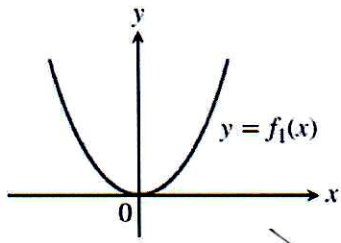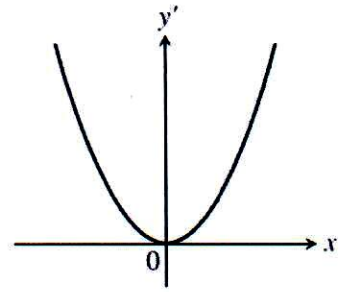
1.2 Graph the derivative of f.

Graph of f'

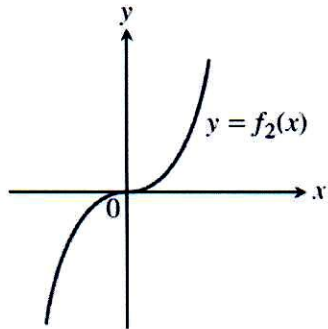2. Match the functions graphed with the derivatives graphed in Exercises 2.1–2.4 the accompanying figures (a)–(d).
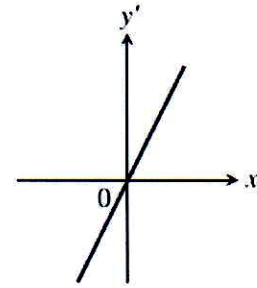
2.1 .

$y = f_1(x)$

(a) .

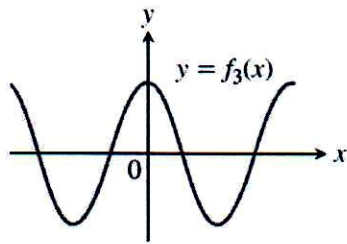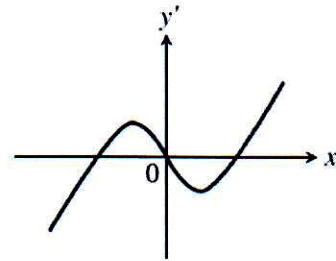

2.2 .

$y = f_2(x)$

(b) .

2.3 .

$y = f_3(x)$

(c) .

2.4 .

$y = f_4(x)$
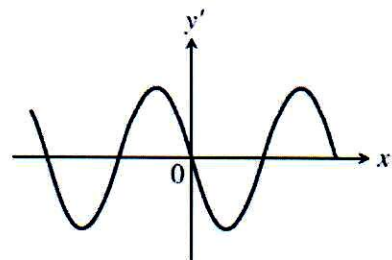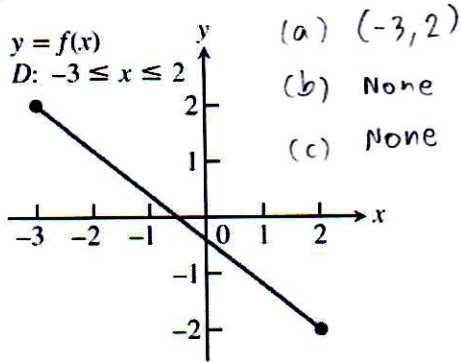
(d) .

2
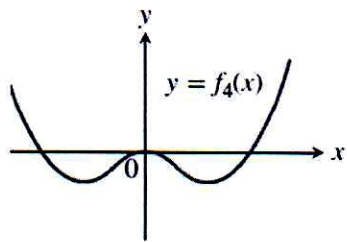
Differentiability & Continuity on an Interval
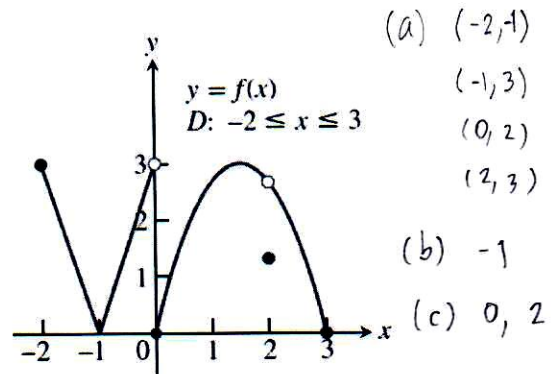
Each figure in Exercises 1–6 shows the graph of a function over a closed interval D. At what domain points does the function appear to be

(a) differentiable?

(b) continuous but not differentiable?
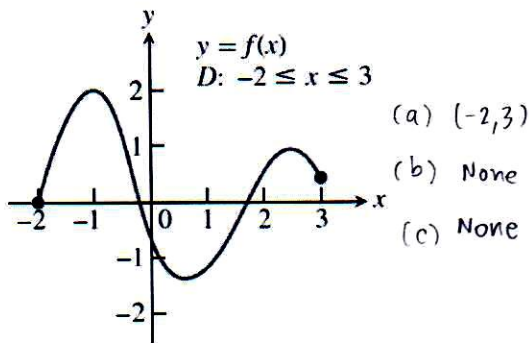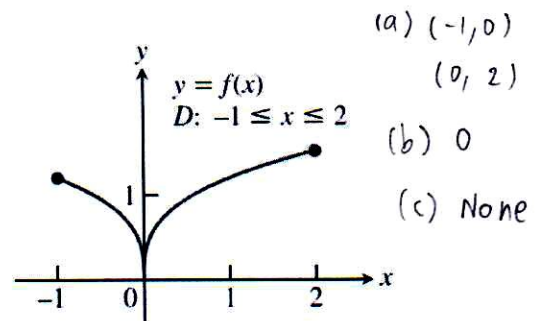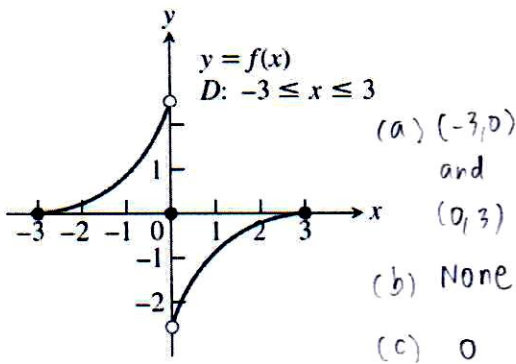
(c) neither continous nor differentiable?

1. .

$y = f(x)$
$D: -3 \le x \le 2$

(a) $(-3, 2)$

(b) None

(c) None

2. .

$y = f(x)$
$D: -2 \le x \le 3$

(a) $(-2, 3)$

(b) None

(c) None

3. .

$y = f(x)$
$D: -3 \le x \le 3$

(a) $(-3, 0)$ and $(0, 3)$

(b) None

(c) 0

4. .

$y = f(x)$
$D: -2 \le x \le 3$

(a) $(-2, -1)$
$(-1, 3)$
$(0, 2)$
$(2, 3)$

(b) -1

(c) 0, 2

5. .

$y = f(x)$
$D: -1 \le x \le 2$

(a) $(-1, 0)$
$(0, 2)$

(b) 0

(c) None

6. .

$y = f(x)$
$D: -3 \le x \le 3$

(a) $(-3, -2)$
$(-2, 2)$
$(2, 3)$

(b) $-2, 2$

(c) None

3