5. Let $f(x)$ be the given function. In page 147, we know that the slope of the tangent line at $(3, 2)$ is exactly equal to

$$f'(3) = \lim_{x\to 3} \frac{f(x) - f(3)}{x - 3}$$

Notice that

$$\frac{f(x) - f(3)}{x - 3} = \frac{1}{x - 3}\left(\frac{x - 1}{x - 2} - 2\right) = \frac{1}{x - 3}\left(\frac{3 - x}{x - 2}\right) = \frac{-1}{x - 2}$$

so that

$$f'(3) = \lim_{x\to 3} \frac{f(x) - f(3)}{x - 3} = \lim_{x\to 3} \frac{-1}{x - 2} = -1$$

The tangent line of $y = f(x)$ at $(3, 2)$ is

$$y - 2 = (-1)(x - 3)$$

11. (a) The particle is moving to the right when $0 < t < 1$ and $4 < t < 6$, to the left when $2 < t < 3$, and standing when $1 < t < 2$, $3 < t < 4$.

(b) See page A72.

17. Recall that given a function $y = g(x)$ in the plane. $g'(a)$ means the slope of the tangent line at $(a, g(a))$ if $g'(a)$ exists. The answer is

$$g'(0) < 0 < g'(4) < g'(2) < g'(-2)$$

19. We only to draw a function with $f(0) = 0$, and the slope of its tangentline at $x = 0$ is 3, at $x = 1$ is 0 and $-1$ as $x = 2$. The following gives an example of such function.

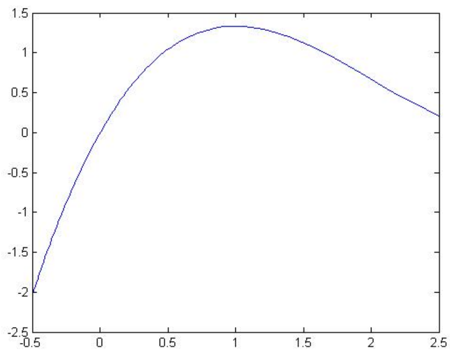


Figure 1: $y = x^3/3 - 2x^2 + 3x$

43. (a) By definition,

$$avg_1 = \frac{C(105) - C(100)}{105 - 100} = \frac{26405/4 - 6500}{105 - 100} = 20.25$$

The other is similar.

$$avg_2 = \frac{C(101) - C(100)}{101 - 100} = 20.05$$

(b) The rate from $x$ to 100 is given by

$$\frac{C(x) - C(100)}{x - 100}$$

the instantaneous rate is given by taking limit.

$$\lim_{x \to 100} \frac{C(x) - C(100)}{x - 100} = \lim_{x \to 100} \frac{0.05x^2 + 10x + 5000 - 6500}{x - 100}$$

Note that

$$\frac{0.05x^2 + 10x + 5000 - 6500}{x - 100} = \frac{1}{20}(x + 300)$$

so

$$\lim_{x \to 100} \frac{C(x) - C(100)}{x - 100} = \lim_{x \to 100} \frac{1}{20}(x + 300) = 20$$