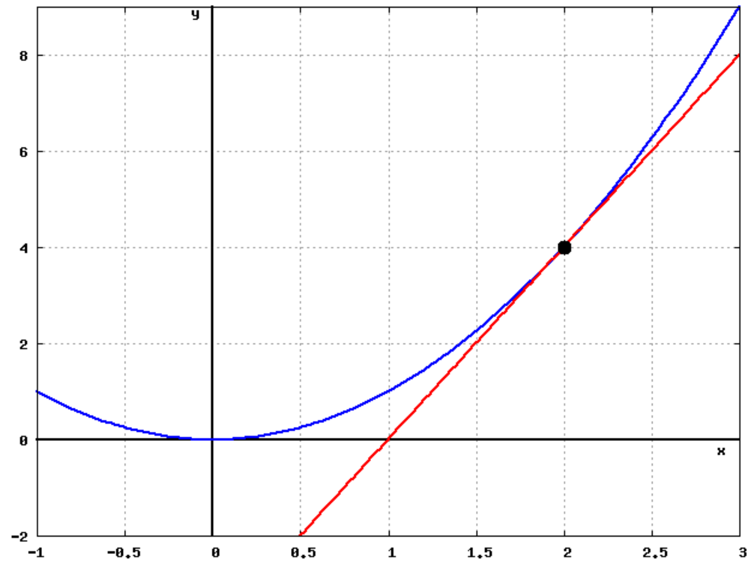
1. Near the point $(2, 4)$, the function $y = x^2$ can be approximated quite well by a linear function whose graph has slope 4. Find an equation for that linear function.

   (a) $y = 4x + 4$

   (b) $y = 4 + 4(x - 2)$

   (c) $2x + 4y = 4$

   (d) $y = x^2 + 4x + 4$



Solution

2. Find an equation of the line perpendicular to the graph of $f(x) = -3x + 5$ and passing through the point $(1, 3)$. Write your result in modified point-slope form.

(a) $y = \frac{1}{3}x + 3$

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

(c) $y = 1 + \frac{1}{3}(x - 3)$

(d) $y = 3 + \frac{1}{3}(x - 1)$

Solution

3. Find the single point of intersection of the graphs of $f(x) = x^3 + 4x^2 - 2x$ and $g(x) = x^2 - 3x - 3$.
(Hint: Factor by grouping.)

(a) $(1, 3)$

(b) $(-1, 6)$

(c) $(-3, 15)$

(d) $(3, -3)$

Solution

4. Solve for x. Factor first, then expand and factor again.

$$x^3(18x) - 9(x^2 - 3)(3x^2) = 0$$

(a) $x = 0, \quad x = 3, \quad x = -3$

(b) $x = 2, \quad x = -2$

(c) $x = 2, \quad x = -2, \quad x = 3, \quad x = -3$

(d) $x = 0, \quad x = 3, \quad x = 2$

Solution

5. Rationalize the numerator and simplify: $\dfrac{\sqrt{x+3}-\sqrt{3}}{x}$

(a) $\dfrac{1}{\sqrt{x+3}-\sqrt{3}}$

(b) $\dfrac{1}{\sqrt{x}}$

(c) $\dfrac{x}{\sqrt{x^2+3x}+\sqrt{3}}$

(d) $\dfrac{1}{\sqrt{x+3}+\sqrt{3}}$

Solution

Problem 1 — The answer is (b).

The line with slope 4 passing through the point $(2, 4)$ is given in modified point-slope form by

$$y = 4 + 4(x - 2).$$

Back to Problem 1

Problem 2 — The answer is (d).

The slope of a line perpendicular to $y = -3x + 5$ is $m = 1/3$ (slopes are opposite reciprocals). The line with slope $1/3$ passing through $(1, 3)$ is

$$y = 3 + \frac{1}{3}(x - 1).$$

Back to Problem 2

Problem 3 — The answer is (c).

$$x^3 + 4x^2 - 2x = x^2 - 3x - 3$$

$$x^3 + 3x^2 + x + 3 = 0$$

$$(x + 3)(x^2 + 1) = 0$$

$$x = -3$$

$$f(-3) = g(-3) = 15$$

Back to Problem 3

Problem 4 — The answer is (a).

$$x^3(18x) - 9(x^2 - 3)(3x^2) = 0$$

$$9x^2(2x^2 - 3x^2 + 9) = 0$$

$$-9x^2(x^2 - 9) = 0$$

$$-9x^2(x - 3)(x + 3) = 0$$

$$x = 0, \quad x = 0, \quad x = 3, \quad x = -3$$

Back to Problem 4

Problem 5 — The answer is (d).

$$\frac{\sqrt{x+3}-\sqrt{3}}{x}\cdot\frac{\sqrt{x+3}+\sqrt{3}}{\sqrt{x+3}+\sqrt{3}}=\frac{(x+3)-3}{x(\sqrt{x+3}+\sqrt{3})}$$

$$\frac{x}{x(\sqrt{x+3}+\sqrt{3})}=\frac{1}{\sqrt{x+3}+\sqrt{3}}$$

Back to Problem 5