Sample Test 3

1. Find $f \cdot g$ if $f(x) = 6x - 1$ and $g(x) = 7x + 7$.

   (a) $13x^2 + 35x + 6$ (b) $42x^2 + x - 7$ (c) $42x^2 + 35x - 7$ (d) $42x^2 - 7$

2. The domain of $f(x) = \sqrt{3 - x}$ is $(-\infty, 3]$, the domain of $g(x) = \sqrt{x}$ is $[0, \infty)$. What is the domain of $\dfrac{f}{g}$?

   (a) $[0, 3]$ (b) $[0, 3)$ (c) $(0, 3]$ (d) $(0, 3)$

3. Find $f \circ g$ if $f(x) = \sqrt{x + 7}$ and $g(x) = 8x - 11$.

   (a) $8\sqrt{x + 7} - 11$ (b) $2\sqrt{2x - 1}$ (c) $8\sqrt{x - 4}$ (d) $2\sqrt{2x + 1}$

4. Which of the following functions is **not** one-to one?

   (a) $f(x) = x^2$ on $(0, 5)$ (b) $f(x) = x^2$ on $(-5, 0)$ (c) $f(x) = x^2$ on $(-5, 5)$
   (d) $f(x) = x^3$ on $(-\infty, \infty)$

5. If the function $f(x) = 7x - 3$ is one-to-one, find its inverse.

   (a) $f^{-1}(x) = \dfrac{x - 7}{7}$ (b) $f^{-1}(x) = \dfrac{x + 7}{7}$ (c) $f^{-1}(x) = \dfrac{x - 3}{7}$ (d) $f^{-1}(x) = \dfrac{x + 3}{7}$

6. Find the vertex of the parabola $y = (x + 5)^2 + 4$.

   (a) $(-5, 4)$ (b) $(-4, 5)$ (c) $(4, -5)$ (d) $(4, -25)$

7. Find the axis of symmetry of the of the parabola $f(x) = x^2 + 4x + 11$.

   (a) $x = -4$ (b) $x = -2$ (c) $x = 2$ (d) $y = 4$

8. A farmer has 1000 yards of fencing material. What is the largest rectangular area he can enclose. Express your answer in square yards.

   (a) $30,000$ (b) $62,500$ (c) $250,000$ (d) $1,000,000$

9. List the potential rational zeros of $f(x) = 6x^4 + 4x^3 - 2x^2 + 2$. **Do not solve!**

   (a) $\pm\frac{1}{6}, \pm\frac{1}{3}, \pm\frac{1}{2}, \pm\frac{2}{3}, \pm 1, \pm 2, \pm 3$ (b) $\pm\frac{1}{6}, \pm\frac{1}{2}, \pm\frac{1}{3}, \pm 1, \pm 2$

   (c) $\pm\frac{1}{6}, \pm\frac{1}{3}, \pm\frac{1}{2}, \pm\frac{2}{3}, \pm 1, \pm 2$ (d) $\pm\frac{1}{2}, \pm\frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 6$

10. Which are the points where the graph of the polynomial $f(x) = 7(x-5)(x+5)^2$ crosses the x-axis.

    (a) $x = 5$ only (b) $x = -5$ only (c) at $x = 5$ and at $x = -5$ (d) nowhere

11. Use synthetic division to find $(3x^3 + 22x^2 + 22x - 12) : (x + 6)$.

    (a) $3x + 4$ (b) $3x^2 + 4x - 2$ (c) $-3x^2 - 6x - 2$ (d) $\frac{1}{2}x^2 + \frac{11}{3}x + \frac{11}{3}$

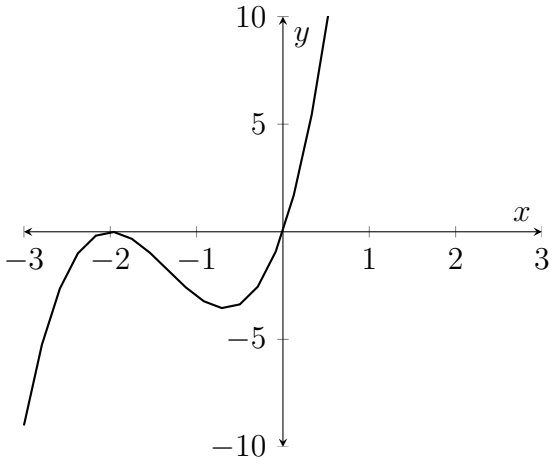
12. Use the factor theorem to decide which of the following is a factor of $3x^3 + 4x^2 - 3x + 2$.

    (a) $x - 2$ (b) $x + 2$ (c) $x - 1$ (d) $x + 1$

13. Find the remainder of $x^{1000} - 2^{1000} + 3$ when divided by $x - 2$.

    (a) 0 (b) 3 (c) 4 (d) 2^{1000}

14. Which of the following functions could be the one whose graph is shown in the picture?



    (a) $3x^2(x + 2)$ (b) $3x(x + 2)^2$ (c) $3x(x - 2)^2$ (d) $3x^2(x - 2)^2$

15. Find the end behavior of $f(x) = -x^5 + 2x$.

(a) $f(x) \to \infty$ as $x \to \infty$ and $f(x) \to \infty$ as $x \to -\infty$
(b) $f(x) \to \infty$ as $x \to \infty$ and $f(x) \to -\infty$ as $x \to -\infty$
(c) $f(x) \to -\infty$ as $x \to \infty$ and $f(x) \to \infty$ as $x \to -\infty$
(d) $f(x) \to -\infty$ as $x \to \infty$ and $f(x) \to -\infty$ as $x \to -\infty$

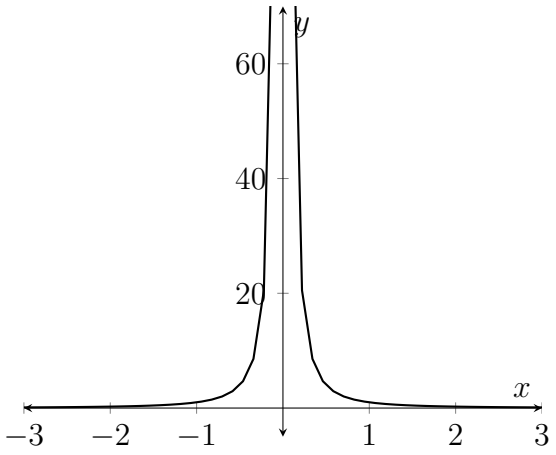
16. Find the horizontal asymptote of $h(x) = \dfrac{3x^2 - 9x - 4}{5x^2 - 4x + 8}$.

(a) none (b) $y = \dfrac{9}{4}$ (c) $y = 0$ (d) $y = \dfrac{3}{5}$

17. Find the vertical asymptotes and holes of $h(x) = \dfrac{x^2 - 3x + 2}{x^2 - 4}$.

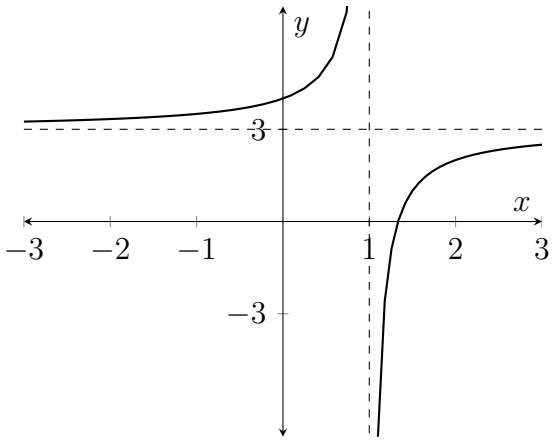
(a) Asymptotes at $x = \pm 2$ (b) Asymptote at $x = 2$, hole at $x = -2$
(c) Asymptote at $x = -2$, hole at $x = 2$ (d) Holes at $x = \pm 2$

18. Which function matches the graph below?



(a) $f(x) = \dfrac{1}{x}$ (b) $f(x) = \dfrac{1}{x^2}$ (c) $f(x) = \dfrac{2}{x}$ (d) $f(x) = x^2$

19. Which function matches the graph below?



(a) $f(x) = 3 + \dfrac{1}{x+1}$ (b) $f(x) = 3 - \dfrac{1}{x+1}$ (c) $f(x) = 3 - \dfrac{1}{x-1}$ (d) $f(x) = 3 + \dfrac{1}{x-1}$

20. Solve the inequality $x^2 + x \leq 1$.

(a) $x \geq \dfrac{-1+\sqrt{5}}{2}$ (b) $x \leq \dfrac{-1-\sqrt{5}}{2}$ or $x \geq \dfrac{-1+\sqrt{5}}{2}$ (c) $x < \dfrac{-1-\sqrt{5}}{2}$ or $x > \dfrac{-1+\sqrt{5}}{2}$ (d) $\dfrac{-1-\sqrt{5}}{2} \leq x \leq \dfrac{-1+\sqrt{5}}{2}$

21. Solve the inequality $(x+3)(x-3)(x-5) > 0$.

(a) $(-\infty, 3)$ (b) $(-\infty, -3) \cup (5, \infty)$ (c) $(-3, 3) \cup (5, \infty)$ (d) $(5, \infty)$

22. Solve the inequality $\dfrac{2x}{7-x} \geq x$.

(a) $(7, \infty)$ (b) $(0, 5] \cup (7, \infty)$ (c) $(-\infty, 0] \cup [5, 7]$ (d) $(-\infty, 0] \cup [5, 7)$

Solution key:

1. c
2. c
3. b
4. c
5. d
6. a
7. b
8. b
9. c
10. a
11. b
12. b
13. b
14. b
15. c
16. d
17. c
18. b
19. c
20. d
21. c
22. d