Sample Test 3

1. Suppose y varies directly as the square root of x, and that $y = 18$ when $x = 36$. What is y when $x = 9$

   (a) 7 (b) 8 (c) 9 (d) 10

2. 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) $42x^2 - 7$

3. 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) $(0, 3)$

4. 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) $2\sqrt{2x + 1}$

5. 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 $(-\infty, \infty)$

6. 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) $f^{-1}(x) = \dfrac{x + 3}{7}$

7. Find the end behavior of $p(x) = (2 - x)(x^2 + 2x - 1)$

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

8. Find the end behavior of $f(x) = x^4 - 2x$.

   (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 $x \to -\infty$

9. 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

10. 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) $\dfrac{-1-\sqrt{5}}{2} \leq x \leq \dfrac{-1+\sqrt{5}}{2}$

11. 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) $(5, \infty)$

12. 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) $\dfrac{1}{2}x^2 + \dfrac{11}{3}x + \dfrac{11}{3}$

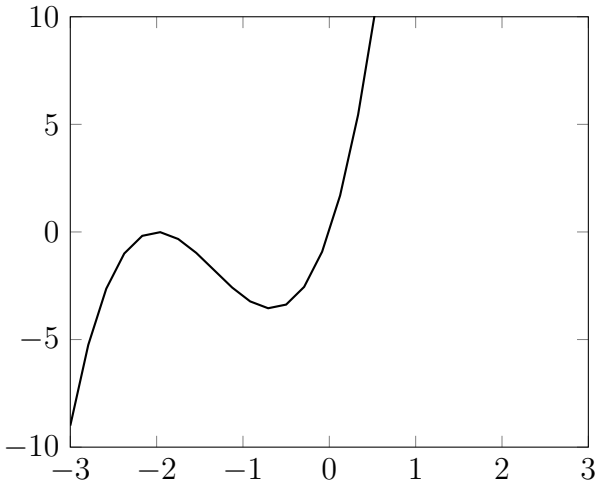
13. Use the factor theorem to decide which of the following is a factor of $3x^3 + 4x^2 - 3x + 2$.

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

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

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

15. 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) $3x^2(x-2)^2$

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

(a) $\pm\frac{1}{6}, \pm\frac{1}{3}, \pm\frac{1}{2}, \pm\frac{2}{3}, \pm1, \pm2, \pm3$ (b) $\pm\frac{1}{6}, \pm\frac{1}{2}, \pm\frac{1}{3}, \pm1, \pm2$

(c) $\pm\frac{1}{6}, \pm\frac{1}{3}, \pm\frac{1}{2}, \pm\frac{2}{3}, \pm1, \pm2$ (d) $\pm\frac{1}{2}, \pm\frac{3}{2}, \pm1, \pm2, \pm3, \pm6$

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

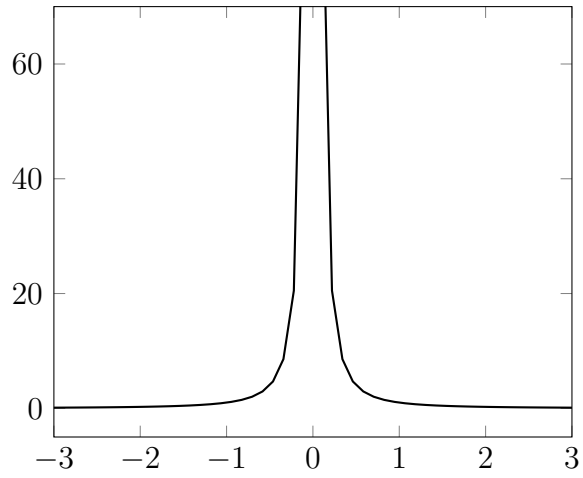
(a) none (b) $y = \frac{9}{4}$ (c) $y = 0$ (d) $y = \frac{3}{5}$

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

(a) Asymptotes at $x = \pm2$ (b) Asymptote at $x = 2$, hole at $x = -2$

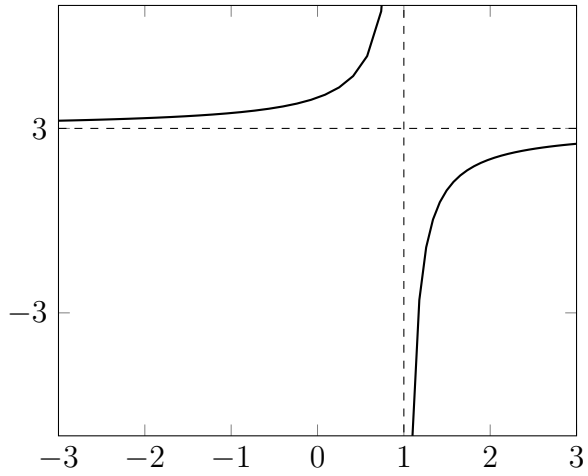
(c) Asymptote at $x = -2$, hole at $x = 2$ (d) Holes at $x = \pm2$

19. 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) $f(x) = x^2$

20. 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) $f(x) = 3 + \dfrac{1}{x-1}$

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