

Directions: On an answer sheet, fill in the following in the appropriate spaces and darken the corresponding ovals:

1. Last name, first and middle initials.
2. Social Security Number.
3. Your signature on the back.

There are 40 problems. You will find two sheets of scratch paper stapled to the end of the exam. **CALCULATORS ARE NOT ALLOWED.**

1. Perform the indicated operation and simplify. $(2x - 5)(3x + 4)$

- (a) $6x^2 - 20$ (d) $5x^2 - 2x - 20$
(b) $6x^2 - 7x - 20$ (e) $5x - 1$
(c) $5x^2 - 7x - 20$

2. Perform the indicated operations and simplify. $(2x^2)^3(4x^3)$

- (a) $32x^9$ (d) $6x^8$
(b) $32x^8$ (e) None of (a), (b), (c), or (d).
(c) $8x^8$

3. Factor the following expression completely. $x^2 - x - 12$

- (a) $(x - 6)(x + 2)$ (d) $(x - 4)(x + 3)$
(b) $(x - 3)(x + 4)$ (e) None of (a), (b), (c), or (d).
(c) $(x + 6)(x - 2)$

4. Reduce the following rational expression to lowest terms. $\frac{x^2 + x - 6}{x^2 - 4}$.

- (a) $\frac{x + 3}{x + 2}$ (d) $x - 2$
(b) $\frac{x + 3}{x - 2}$ (e) None of (a), (b), (c), or (d).
(c) $\frac{x - 6}{-4}$

5. Solve for x : $7 - 2x = 9 + 3x$.

- (a) $x = 2$ (d) $x = -\frac{2}{5}$
(b) $x = -2$ (e) $x = -3$
(c) $x = \frac{2}{5}$

6. Solve for x : $x^2 - 3x + 2 = 0$.

(a) $x = 1$ or $x = 2$

(d) $x = 2$ or $x = -3$

(b) $x = 1$ or $x = -2$

(e) None of (a), (b), (c), or (d).

(c) $x = 2$ or $x = 3$

7. Solve for x : $x^2 - 2x - 4 = 0$.

(a) $x = 4$ or $x = 2$

(d) $x = 1 + \sqrt{5}$ or $x = 1 - \sqrt{5}$

(b) $x = \frac{4 + \sqrt{5}}{2}$ or $x = \frac{2 - \sqrt{5}}{2}$

(e) None of (a), (b), (c), or (d).

(c) $x = \frac{2 + \sqrt{5}}{2}$ or $x = \frac{4 - \sqrt{5}}{2}$

8. Solve the inequality $9x - 5 < 6x + 1$.

(a) $x < 2$

(d) $x > \frac{2}{5}$

(b) $x > 2$

(e) None of (a), (b), (c), or (d).

(c) $x < \frac{2}{5}$

9. Solve the inequality $|x - 2| < 3$.

(a) $-2 < x < 1$

(d) $0 < x < 1$

(b) $-2 < x < 5$

(e) None of (a), (b), (c), or (d).

(c) $2 < x < 5$

10. Solve the inequality $x^2 - 4 > 0$.

(a) $-2 < x < 2$

(d) $x > 4$

(b) $x < -2$ or $x > 2$

(e) None of (a), (b), (c), or (d).

(c) $x > 2$

11. Simplify: $2\sqrt{3} - \sqrt{48}$.

- (a) $2\sqrt{3}$ (d) $\sqrt{45}$
(b) $-14\sqrt{3}$ (e) $-\sqrt{36}$
(c) $-2\sqrt{3}$

12. Simplify; leave your answer in factored form. $\frac{1}{x-1} - \frac{2}{x+2}$

- (a) $\frac{-1}{2x+1}$ (d) $\frac{-x+4}{(x-1)(x+2)}$
(b) $\frac{2x+1}{(x+1)(x+2)}$ (e) None of (a), (b), (c), or (d).
(c) -1

13. Perform the indicated operation and simplify the result. $\frac{\left(\frac{x}{x+1}\right)}{\left(\frac{2x+2}{x^2}\right)}$

- (a) $\frac{x^2}{2x+4}$ (d) $\frac{2}{x}$
(b) $\frac{x^3}{2x^2+4x+2}$ (e) None of (a), (b), (c), or (d).
(c) $\frac{x^3}{2x^2+2}$

14. Simplify. $\left(\frac{27}{8}\right)^{-\frac{2}{3}}$

- (a) $\frac{9}{4}$ (d) $\frac{-16}{81}$
(b) $\frac{4}{9}$ (e) None of (a), (b), (c), or (d).
(c) $\frac{-4}{9}$

15. Solve the equation $\sqrt{2t+3} = 5$.

(a) $t = 1$

(d) $t = 11$

(b) $t = \frac{7}{2}$

(e) None of (a), (b), (c), or (d).

(c) $t = 5$

16. Find the distance between $(-1, -3)$ and $(2, 1)$.

(a) 7

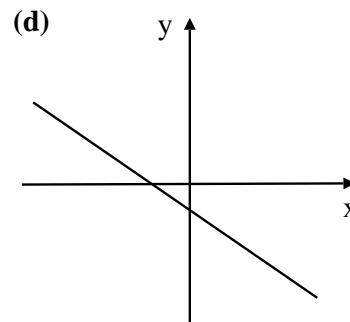
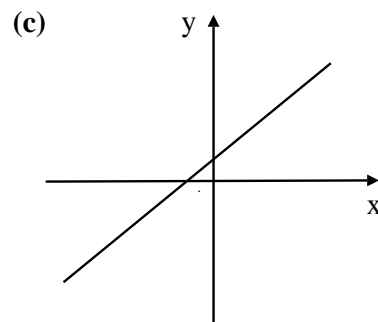
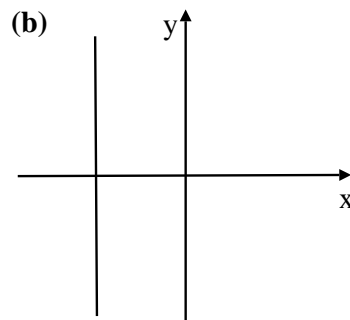
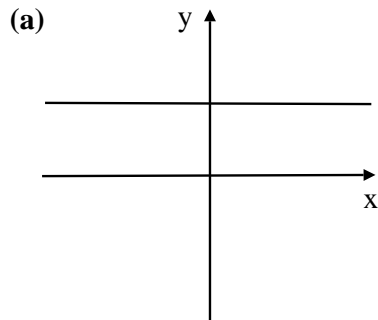
(d) 1

(b) $\sqrt{5}$

(e) None of (a), (b), (c), or (d).

(c) 25

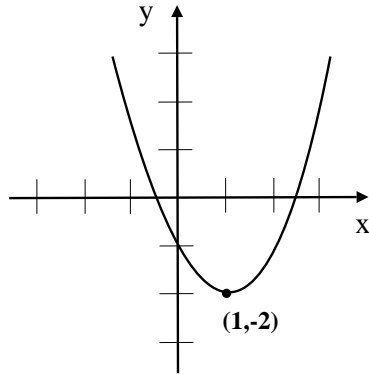
17. Which of the following is a line with negative slope?



(e) None of these

18. Find the x -intercepts of the graph of the equation $y - x^2 - 4 = 0$.
- (a) The x -intercepts are $\sqrt{2}$ and $-\sqrt{2}$. (d) The only x -intercept is 2.
(b) The only x -intercept is -4 . (e) None of (a),(b),(c), or (d).
(c) The x -intercepts are 2 and -2 .
19. Find the slope of the line through $(-3, -1)$ and $(1, 7)$.
- (a) 2 (d) 3
(b) $\frac{1}{2}$ (e) None of (a), (b), (c), or (d).
(c) -3
20. Find an equation for the line through $(0, 3)$ and $(-2, 0)$.
- (a) $2x - 3y + 6 = 0$ (d) $2x + 3y - 6 = 0$
(b) $3x + 2y - 6 = 0$ (e) $3x + 2y + 6 = 0$
(c) $3x - 2y + 6 = 0$
21. Consider the function $f(x) = x^3 + x$. Find $f(-2)$.
- (a) 6 (d) -10
(b) 10 (e) None of (a), (b), (c), or (d).
(c) -6
22. Consider the function $f(x) = x^2 - 2$. Find $f(y + 2)$.
- (a) $x^2y + 2x^2 - 2y - 4$ (d) $y^2 + 2$
(b) $y^2 + 4y + 2$ (e) None of (a), (b), (c), or (d).
(c) y^2

23. Which function represents the graph?



(a) $f(x) = (x - 1)^2 - 2$

(d) $f(x) = -(x - 2)^2 - 1$

(b) $f(x) = (x - 2)^2 - 1$

(e) $f(x) = -(x + 1)^2 - 2$

(c) $f(x) = -(x + 2)^2 - 1$

24. Let $f(x) = x^2 + x + 1$ and let $g(x) = x + 1$. Find the composite function $f \circ g$.

(a) $(f \circ g)(x) = x^2 + 3x + 2$

(d) $(f \circ g)(x) = x^3 + 2x^2 + 2x + 1$

(b) $(f \circ g)(x) = x^2 + 3x + 3$

(e) None of (a), (b), (c), or (d).

(c) $(f \circ g)(x) = x^2$

25. Find the domain of the function $f(x) = \frac{x + 1}{x - 1}$.

(a) All real numbers except $x = -1$.

(b) All real numbers except $x = 1$ and $x = -1$.

(c) All real numbers except $x = 1$.

(d) All real numbers.

(e) None of (a), (b), (c), or (d).

26. Find all the zeros and their multiplicities for the polynomial

$$p(x) = 11x(x - 1)^5(x + 6)$$

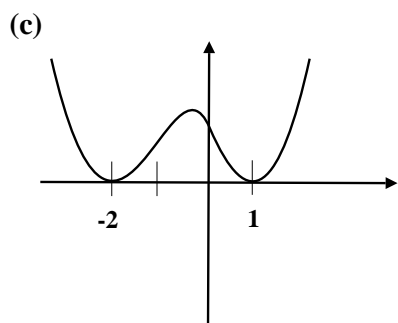
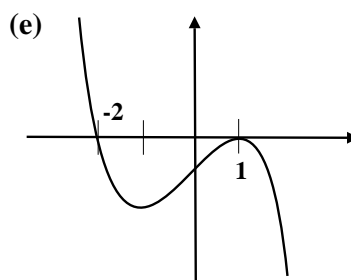
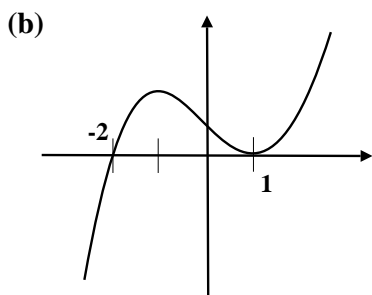
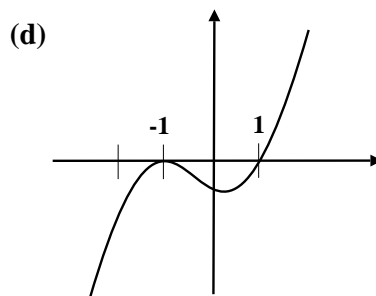
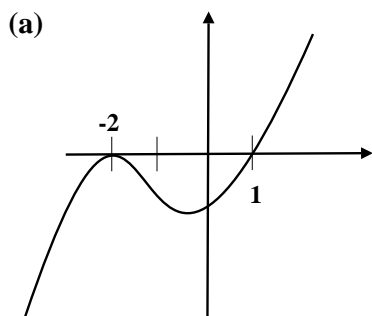
- (a) -1 is a zero of multiplicity 5, 6 is a zero of multiplicity 1, and 0 is a zero of multiplicity 1.
- (b) 1 is a zero of multiplicity 5, -6 is a zero of multiplicity 1, and 0 is a zero of multiplicity 1.
- (c) -1 is a zero of multiplicity 5 and 6 is a zero of multiplicity 1.
- (d) 1 is a zero of multiplicity 5 and -6 is a zero of multiplicity 1.
- (e) None of (a), (b), (c), or (d).

27. Find the asymptotes of the following function.

$$f(x) = \frac{3x^2 - 3x}{x^2 + x - 12}$$

- (a) The horizontal asymptote is $y = 0$ and the vertical asymptotes are $x = -4$ and $x = 3$.
- (b) The horizontal asymptote is $y = 3$ and the vertical asymptotes are $x = 4$ and $x = -3$.
- (c) The horizontal asymptote is $y = 3$ and the vertical asymptotes are $x = -4$ and $x = 3$.
- (d) The horizontal asymptote is $y = -4$ and the vertical asymptote is $x = 3$.
- (e) None of (a), (b), (c), or (d).

28. Which of the following is the graph of $p(x) = (x - 1)^2(x + 2)$?



29. Find the value of $\log_2(4)$.

(a) 16

(d) -2

(b) $\frac{1}{2}$

(e) None of (a), (b), (c), or (d).

(c) 2

30. Find the value of $\log_9\left(\frac{1}{3}\right)$.

(a) -2

(d) 2

(b) $\frac{1}{2}$

(e) None of (a), (b), (c), or (d).

(c) $-\frac{1}{2}$

31. Solve the equation: $\log_5 x = 2$.

(a) $x = 100$

(d) $x = 10$

(b) $x = 32$

(e) $x = .01$

(c) $x = 25$

32. Solve the equation: $8 = 2^{x-1}$.

(a) $x = 4$

(d) $x = -2$

(b) $x = 3$

(e) None of (a), (b), (c), or (d).

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

33. The following function is one-to-one. Find its inverse. $f(x) = 3x + 1$

(a) $f^{-1}(x) = \frac{x-1}{3}$

(d) $f^{-1}(x) = -3x - 1$

(b) $f^{-1}(x) = \frac{x}{3} - 1$

(e) None of (a), (b), (c), or (d).

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

38. For $f(x) = 2x^2 - 3x$, find and simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$.

- (a) $2h + 3$ (d) $4x + 2h - 3$
 (b) $2h - 3$ (e) None of (a), (b), (c), or (d).
 (c) $4x + 2h + 3$

39. For a certain product, the price p and the quantity x sold obey the demand equation

$$p = -\frac{1}{6}x + 100 \quad , \quad \text{for } 0 \leq x \leq 600 \quad .$$

Find the value of x that will maximize the revenue.

- (a) $\frac{100}{6}$ (d) 600
 (b) $\frac{100}{3}$ (e) None of (a), (b), (c), or (d).
 (c) 300

40. Which of the following is the graph of $y = \ln x$?

