PreCalculus Semester 1 Review Key

1) In which of the following equations is y a function of x?

(a) $2x + 3y - 1 = 0$ (b) $x^2 + 3y^2 = 7$ (c) $2x^2y = 7$

(d) Both a and b (e) Both a and c

2) Given $f(x) = \begin{cases} 3x + 4, & x \le 2 \\ x^2 + 1, & x > 2 \end{cases}$, find $f(3)$.

(a) 13 (b) 10 (c) 5

(d) 3 (e) None of these

3) For what values of x does $f(x) = g(x)$?

$f(x) = 3x + 1 \quad g(x) = x^2 - 3$

$3x+1 = x^2-3$

$0 = x^2-3x-4 \quad 0 = (x-4)(x+1)$

(a) 0 (b) 4, 1 (c) $-4, -1$

(d) $4, -1$ (e) None of these

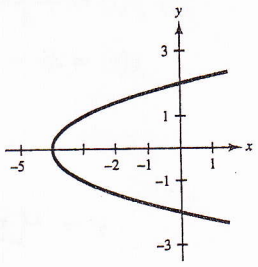
4) Find the domain of the function $f(x) = \dfrac{2x-1}{2x+1}$ $2x+1 \neq 0 \quad x \neq -\frac{1}{2}$

(a) $(-\infty, 1) \cup (1, \infty)$ (b) $(-\infty, -1) \cup (-1, \infty)$ (c) $\left(-\infty, -\frac{1}{2}\right) \cup \left(-\frac{1}{2}, \infty\right)$

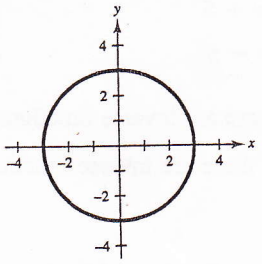
(d) $\left(-\infty, \frac{1}{2}\right) \cup \left(\frac{1}{2}, \infty\right)$ (e) None of these

5) Use the vertical line test to determine in which case y is a function of x.

(a)



(b)



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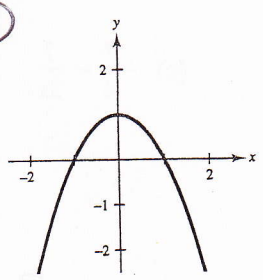
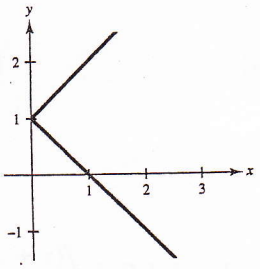


(d)



(e) None of these

6) The function $f(x) = 3x^2 - 5$ is:

(a) odd. (b) even. (c) both. (d) neither.

7) Describe the transformation of the graph of $f(x) = |x|$ for the graph of $g(x) = |x| - 20$.

(a) Vertical shift 20 units up
(b) Vertical shift 20 units down
(c) Horizontal shift 20 units to the right
(d) Horizontal shift 20 units to the left
(e) None of these

8) The point $\left(-\frac{3}{8}, 0\right)$ is on the graph of f. If g is a translation of f, so that $g(x) = f(x + 2) + \frac{1}{2}$, then the coordinates of the translated point are:

$-\frac{3}{8} - 2$, $0 + \frac{1}{2}$

$-\frac{3}{8} - \frac{16}{8} = \left(-\frac{19}{8}, \frac{1}{2}\right)$

left 2 up $\frac{1}{2}$

(a) $\left(2, \frac{1}{2}\right)$. (b) $\left(-2, -\frac{1}{2}\right)$. (c) $\left(\frac{13}{8}, \frac{1}{2}\right)$.
(d) $\left(-\frac{19}{8}, \frac{1}{2}\right)$. (e) None of these

9) Given $f(x) = x$ and $g(x) = x^2 - 7$, find $(fg)(3)$. (3)(2)

(a) -13 (b) 29 (c) 5
(d) 6 (e) None of these

10) Given $f(x) = 4 - 2x^2$ and $g(x) = 2 - x$, find $(f \circ g)(x)$. $4 - 2(2-x)^2 = 4 - 2(4 - 4x + x^2)$

$4 - 8 + 8x - 2x^2$

$-4 + 8x - 2x^2$

(a) $4x^2 - 16x + 20$ (b) $2x^2 - 4$ (c) $2x^2 - 2$
(d) $-2x^3 - 4x^2 - 4x + 8$ (e) None of these

11) Graphically determine which sets are not inverse functions of each other.

(a) $f(x) = x + 5$, $g(x) = x - 5$
(b) $f(x) = x^3$, $g(x) = \sqrt[3]{x}$
(c) $f(x) = \frac{x + 2}{4}$, $g(x) = 4x - 2$
(d) All of these are inverse functions of each other.
(e) None of these are inverse functions of each other.

12) Find the inverse function of the function: $f(x) = \frac{4 + 5x}{7}$.

$x = \frac{4 + 5y}{7}$

$7x = 4 + 5y$

$\frac{7x - 4}{5} = y$

(a) $\frac{7}{5}(x - 4)$ (b) $\frac{1}{5}(7x - 4)$ (c) $-\frac{7}{4} - \frac{7}{5x}$
(d) $\frac{7}{4 + 5x}$ (e) None of these

13) Given $f(x) = 2 - 3x^2$, find $\frac{f(x + \Delta x) - f(x)}{\Delta x}$.

$\frac{2 - 3(x + \Delta x)^2 - (2 - 3x^2)}{\Delta x}$

(a) 2 (b) $-6x - 3\Delta x$ (c) $-6x$
(d) $\frac{6x^2 + 6x\Delta x + 9(\Delta x)^2}{\Delta x}$ (e) None of these

$\frac{2 - 3(x^2 + 2x\Delta x + \Delta x^2) - 2 + 3x^2}{\Delta x}$

$\frac{\Delta x(-6x - 3\Delta x)}{\Delta x}$

$\frac{2 - 3x^2 - 6x\Delta x - 3\Delta x^2 - 2 + 3x^2}{\Delta x}$

complete square

$2x^2 + 16x + 9$

$y + 32 = 2(x^2 + 8x + 16) + 9$

$y = 2(x+4)^2 - 23$

14) Find the standard form of the parabola: $y = 2x^2 + 16x + 9$.

(a) $y = 2(x + 4)^2 - 7$ (b) $y = 2(x + 2)^2 + 5$ (c) $y = 2(x + 4)^2 - 23$

(d) $y = 2(x + 8)^2 + 73$ (e) None of these

15) Find the number of units that produce a maximum revenue, $R = 95x - 0.1x^2$, where R is the total revenue in dollars and x is the number of units sold.

max $x = \frac{-b}{2a} = \frac{-95}{2(-.1)} = \frac{-95}{-.2}$

$x = \frac{95}{\frac{2}{10}}$

$x = \frac{950}{2}$

$x = 475$

(a) 716 (b) 475 (c) 371 (d) 550 (e) None of these

16) Determine the left-hand and right-hand behavior of the graph: $y = 4x^2 - 2x + 1$.

(a) Up to the left, down to the right (b) Down to the left, up to the right

(c) Up to the left, up to the right (d) Down to the left, down to the right

(e) None of these

17) Find a polynomial function with the given zeros: 0, −1, and 2.

(a) $f(x) = x(x - 1)(x + 2)$ (b) $f(x) = x(x + 1)(x - 2)$

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

(e) None of these

18) Divide: $(9x^3 - 6x^2 - 8x - 3) \div (3x + 2)$.

$3x+2 \overline{)\,9x^3 - 6x^2 - 8x - 3}$

$3x^2 - 4x$

$-(9x^3 + 6x^2)$

$-12x^2 - 8x$

$-(-12x^2 - 18x)$

$10 - 3$

$3x+2$

(a) $3x^2 - \frac{8}{3}x - \frac{7/3}{3x+2}$ (b) $3x^2 - 4x - 2 + \frac{7}{3x+2}$

(c) $3x^2 - 4x - \frac{3}{3x+2}$ (d) $3x^2 - 4x - \frac{16}{3} + \frac{23/3}{3x+2}$

(e) None of these

19) Find all of the real roots: $x^3 - 7x + 6 = 0$. calc

(a) −3, 1, 2 (b) −2, −1, 3 (c) −6, −1, 1

(d) −1, 1, 6 (e) None of these

20) Simplify, then write your result in standard form: $(6 + \sqrt{-9}) - 2i + 10 - \sqrt{16}$.

$6 + 3i - 2i + 10 - 4$

$12 + i$

(a) $16 - 3i$ (b) $13 - 6i$ (c) $9 - 2i$

(d) $12 + i$ (e) None of these

21) Find the zeros of the function: $f(x) = 6x^2 - 11x + 4$.

$(3x - 4)(2x - 1)$

(a) $\frac{4}{3}, \frac{1}{2}$ (b) $-\frac{2}{3}, -1$ (c) $-\frac{4}{3}, -\frac{1}{2}$

(d) $\frac{2}{3}, 1$ (e) None of these

$3x^2 - 4x + 2 = 0$

$\frac{4 \pm \sqrt{16 - 4(3)(2)}}{6}$

$\frac{4 \pm \sqrt{-8}}{6} = \frac{4 \pm 2\sqrt{2}i}{6}$

$\frac{2 \pm \sqrt{2}i}{3}$

22) Solve for x: $3x^2 = 4x - 2$.

(a) $\frac{2 \pm 2\sqrt{2}i}{3}$ (b) $\frac{2 \pm 2\sqrt{10}}{3}$ (c) $\frac{2 \pm \sqrt{2}i}{3}$

(d) $\frac{2 \pm \sqrt{10}}{3}$ (e) None of these

23) Write as a product of linear factors: $x^4 + 25x^2 + 144$.

(a) $(x^2 + 9)(x^2 + 16)$ (b) $(x + 3i)(x + 3i)(x + 4i)(x + 4i)$

(c) $(x + 3i)(x - 3i)(x + 4i)(x - 4i)$ (d) $(x - 3i)(x - 3i)(x - 4i)(x - 4i)$

(e) None of these

$(x^2+9)(x^2+16)$

24) Find the vertical asymptote(s): $f(x) = \frac{1}{x^2 - 3x - 10}$.

$\frac{1}{(x-5)(x+2)}$

(a) $x = -2, x = 5$ (b) $y = 1$ (c) $y = 0$

(d) $x = -5, x = 2$ (e) None of these

25) Find the horizontal asymptote(s): $f(x) = \frac{x^2 - 1}{x^2 + 9}$.

(a) $y = 1$ (b) $y = 0$ (c) $x = \pm 3$

(d) $x = \pm 1$ (e) None of these

26) Match the graph with the correct function.

(a) $f(x) = \frac{1}{2x - 1}$ (b) $f(x) = \frac{x^2 - 1}{2x - 1}$

(c) $f(x) = \frac{x^2 + 2x + 2}{2x - 1}$ (d) $f(x) = \frac{x^3 + 2x^2 + x - 2}{2x + 1}$

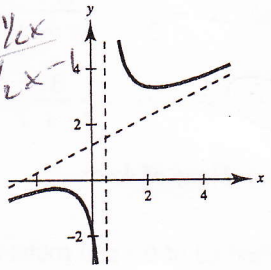
(e) None of these

$\frac{1}{2}x + \frac{3}{4}$

$2x-1 \overline{)x^2 - 1}$

$-x^2 + \frac{1}{2}x$

$\frac{1}{2}x - 1$



$\frac{1}{2}x + \frac{5}{4}$

$2x-1 \overline{)x^2 + 2x + 2}$

$-x^2 + \frac{1}{2}x$

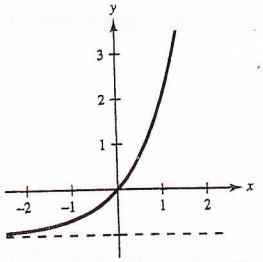
$\frac{5}{2}x$

27) Match the graph with the correct function.

(a) $y = 3^{x-1}$ (b) $y = 3^x - 1$

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

(e) None of these



28) A certain population increases according to the model $P(t) = 250e^{0.47t}$ with $t = 0$ corresponding to 1990. Use the model to determine the population in the year 2000. Round your answer to the nearest integer.

calc

(a) 400 (b) 4091 (c) 27,487 (d) 23,716 (e) None of these

29) Use the properties of exponents to determine which function is the same as $f(x) = 27(3^{1-x})$.

(a) $f_1(x) = 3^{3-3x}$ (b) $f_2(x) = 9^{3-3x}$ (c) $f_3(x) = 3^{3-x}$

(d) $f_4(x) = 81(3^{-x})$ (e) None of these

$3^3(3^{1-x})$ $3^{3+1-x} = 3^{4-x}$ $3^4 \cdot 3^{-x}$ $81(3^{-x})$

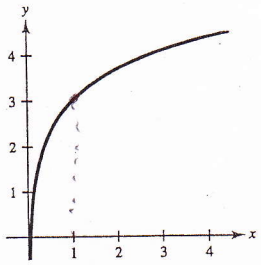
30) Write the exponential form: $\log_b 7 = 13$.

(a) $7^{13} = b$ (b) $b^{13} = 7$ (c) $b^7 = 13$ (d) $7^b = 13$ (e) None of these

31) Match the graph with the correct function.

(a) $f(x) = 3 + \log x$ (b) $f(x) = \log(x + 3)$

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



32) Write as the logarithm of a single quantity: $\frac{1}{2}[\ln(x + 1) + 2\ln(x - 1)] + \frac{1}{3}\ln x$.

(a) $\ln \sqrt[3]{x}\sqrt{(x+1)(x^2-1)}$ (b) $\ln \sqrt[3]{x}\sqrt{x^2-1}$ (c) $\ln \sqrt{x(x^2-1)}$

(d) $\ln \sqrt[3]{x(x+1)(x-1)^2}$ (e) None of these

$\ln \sqrt{x+1}\,(x-1)\sqrt[3]{x}$

33) Solve for x: $5^x = 2$.

(a) $\frac{2}{5}$ (b) $\frac{5}{2}$ (c) $\frac{\ln 2}{\ln 5}$ (d) $-\ln 3$ (e) None of these

34) Solve for x: $\ln(7 - x) + \ln(3x + 5) = \ln(24x)$.

$(7-x)(3x+5) = 24x$

(a) $\frac{6}{11}$ (b) $\frac{7}{3}$ (c) $\frac{7}{3}, -5$ (d) $\frac{6}{11}, 5$ (e) None of these

$21x + 35 - 3x^2 - 5x = 24x$ $-3x^2 + 16x + 35 = 24x$ $3x^2 + 8x - 35 = 0$ $(3x - 7)(x + 5) = 0$

35) Identify the expression that is equivalent to $\log_5 3$.

(a) $\frac{\log 5}{\log 3}$ (b) $5\log 3$ (c) $3\log 5$

(d) $\frac{\ln 3}{\ln 5}$ (e) None of these

36) Simplify: $2e^{3\ln(x+1)}$.

(a) $2(x + 1)e^3$ (b) $6(x + 1)$ (c) $3(x + 1)\ln 2$

(d) $2(x + 1)^3$ (e) None of these

37) Determine the inverse function of $f(x) = 8e^{3x}$.

$x = 8e^{3y}$ $\frac{x}{8} = e^{3y}$ $\ln\frac{x}{8} = 3y$ $\frac{1}{3}\ln\frac{x}{8} = y$

(a) $f^{-1}(x) = \frac{1}{8}e^{-3x}$ (b) $f^{-1}(x) = \frac{x}{8e^3}$ (c) $f^{-1}(x) = \frac{1}{3}(\ln x - \ln 8)$

(d) $f^{-1}(x) = \frac{8}{e^3}$ (e) None of these

38) $1500e^{.0625(2)}$

$\$1500$ is invested at a rate of $6\frac{1}{4}\%$ compounded continuously. What is the balance at the end of two years?

(a) $\$6816.87$ (b) $\$1699.72$ (c) $\$1698.08$ (d) $\$5235.51$ (e) None of these