

Name

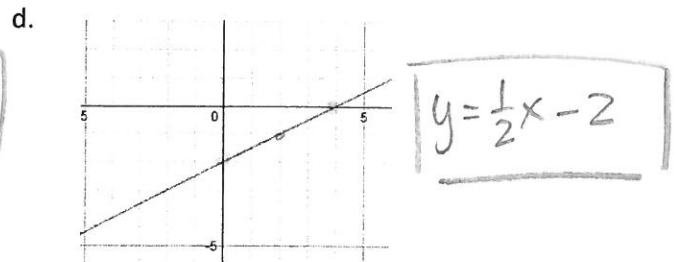
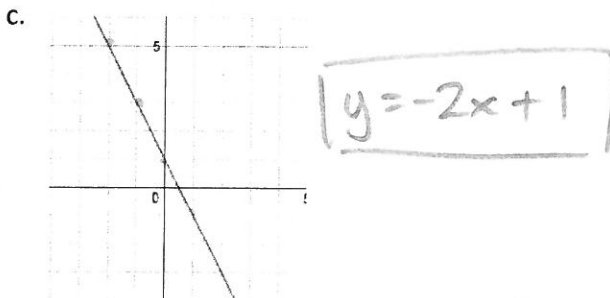
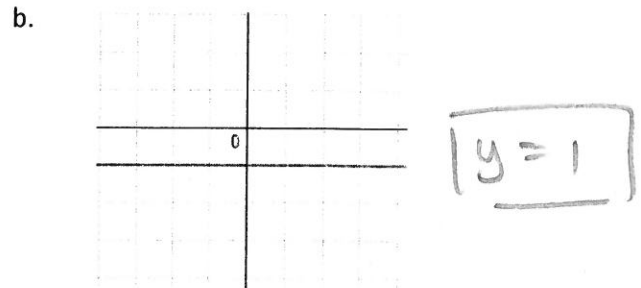
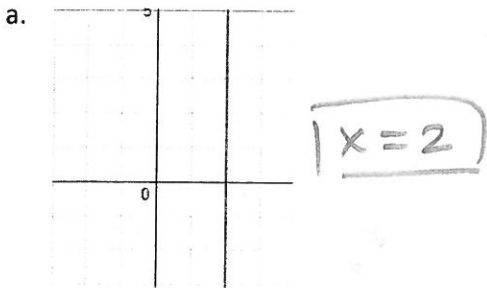
Answer key

Non-Calculator Section

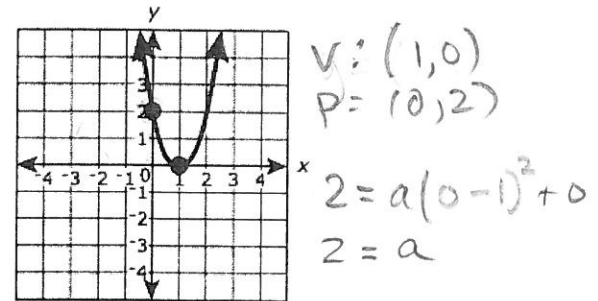
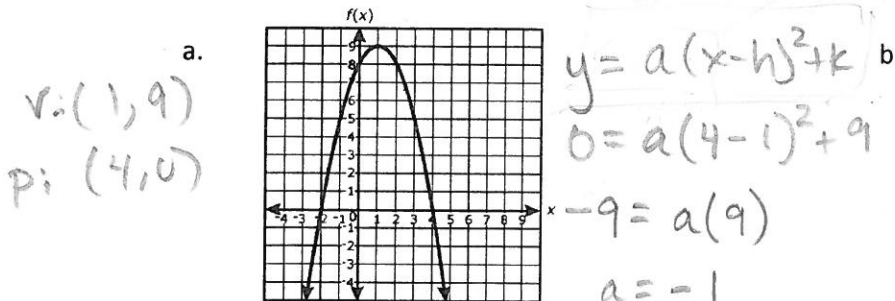
26. What is the solution of $x - 3 = 3x + 4$?

$$\begin{aligned}
 -3 &= 3x + 4 \\
 -4 &\quad -4 \\
 \hline
 -7 &= 2x \\
 \hline
 x &= -7/2
 \end{aligned}$$

27. Write a linear equation for each of the following.



28. Write an equation for each of the following:



$y = -(x-1)^2 + 9$

$y = 2(x-1)^2$

29. For each of the following find the y-intercept, the x-intercepts, the vertex, the axis of symmetry, and min/max.

a. $y = -x^2 + 9$

$-1(x^2 - 9)$
 $-(x+3)(x-3)$

$y\text{-int: } (0, 9)$
 $x\text{-int: } (-3, 0) (3, 0)$
 $v: (0, 9)$
 $AOS: x = 0$
 $Max: y = 9$

b. $y = 3x^2 + 16x + 21$

$(3x+9)(3x+7)$
 $(x+3)(3x+7)$

$AOS: \frac{-16}{2(3)} = -\frac{8}{3}$
 $\rightarrow \left(-\frac{8}{3}, \frac{9}{3}\right) \left(3\left(-\frac{8}{3}\right) + 7\right)$

$\frac{63}{7 \cdot 9}$
 $y\text{-int: } (0, 21)$
 $x\text{-int: } (-3, 0) (-7/3, 0)$
 $AOS: x = -8/3$
 $v: \left(-\frac{8}{3}, -\frac{1}{3}\right)$

30. Simplify each of the following.

a. $\frac{(2a^2b)^3}{2a^4b^4} = \frac{8a^6b^3}{2a^4b^4} = \frac{4a^2}{b}$

b. $\frac{(x^{-2}y^5)^2}{x^3y} = \frac{x^{-4}y^{10}}{x^3y} = \frac{y^9}{x^7}$

31. Given $f(x) = 2x^4 + 3x^3 - 2x + 2$, find $f(-2)$.

$f(-2) = 14$

$$\begin{array}{r|rrrrr} -2 & 2 & 3 & 0 & -2 & 2 \\ & \downarrow & -4 & 2 & -4 & 12 \\ \hline & 2 & -1 & 2 & -6 & 14 \end{array}$$

32. Factor each of the following completely.

a. $4x^2 - 9 = (2x-3)(2x+3)$

b. $x^4 - 9x^6 = x^4(1-9x^2) \rightarrow x^4(1-3x)(1+3x) = -x^4(3x-1)(3x+1)$

c. $10x^2 - 17x + 3 = (2x-3)(5x-1)$

$\frac{(10x-15)(10x-2)}{5 \cdot 5 \cdot 2 \cdot 2}$

d. $x^2 - 21x - 22 = (x-22)(x+1)$

33. What function can be obtained by translating the graph of $y = x^2$ down 2 units and right 5 units?

$y = (x-5)^2 - 2$

34. Find the mean, median, mode, and range of the data set: 3, 6, 7, 4, 1, 3, 10, 8.

1 3 3 4 6 7 8 10

Mean: 5,25
Med: 5
Mode: 3

35. Find the real number solutions of the equation: $2x^6 - 8x^4 = 0$

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

$x = 0, 2, -2$

36. Evaluate each of the following functions.

a. $\cos(-150^\circ) = \frac{-\sqrt{3}}{2}$

b. $\sin\left(-\frac{3\pi}{4}\right) = \frac{-\sqrt{2}}{2}$

c. $\sin 135^\circ = \frac{\sqrt{2}}{2}$

d. $\cos\left(\frac{7\pi}{4}\right) = \frac{\sqrt{2}}{2}$

37. Consider the rational function $g(x) = \frac{x^2 - 9}{x^2 + 2x + 1}$. Write the equations of the horizontal and vertical asymptotes.

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

VA: $x = -1$
 HA: $y = 1$

38. Let $f(x) = x^2 + 3x + 6$ and $g(x) = 2x^2 - 5$. Find:

a. $f(x) + g(x)$ $3x^2 + 3x + 1$

b. $f(x) - g(x)$ $-x^2 + 3x + 11$

c. $f(x) \cdot g(x)$ $2x^4 + 6x^3 + 7x^2 - 15x - 30$

d. $g(f(x))$ $2(x^2 + 3x + 6)^2 - 5$

(Handwritten expansion: $(x^2 + 3x + 6)(x^2 + 3x + 6) = x^4 + 3x^3 + 6x^2 + 3x^3 + 9x^2 + 18x + 6x^2 + 18x + 36 = x^4 + 6x^3 + 21x^2 + 36x + 36$)

39. Simplify $(\sqrt{2} + i\sqrt{3})(\sqrt{2} - i\sqrt{3})$ (DOS)

$$2 - (i\sqrt{3})^2 = 2 - (-1 \cdot 3) = 2 - (-3) = 2 + 3 = 5$$

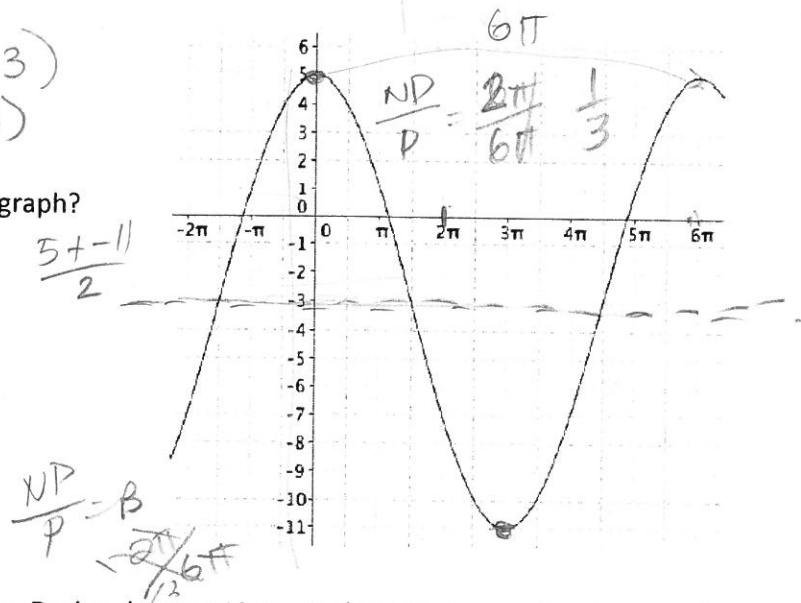
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40. What is the equation of the function shown in the graph?

$$y = a \sin(bx) + d$$

$$y = a \cos(bx) + d$$

$$y = 8 \cos\left(\frac{1}{3}x\right) - 3$$



41. In 2000, the world population was about 6.09 billion. During the next 13 years, the world population increased by about 1.18% each year. Write an exponential model given the population y (in billions), t years after 2000.

Estimate the world population in 2005.

$y = ab^x$

$y = 6.09(1.0118)^t$

$y = 6.09(1.0118)^t$

$y = 6.09(1.0118)^5 \approx 6.5?$

42. What is the range of the graph of the function $f(x) = 3\sin(x) - 1$?

$y \in [-4, 2]$

$$-4 \leq y \leq 2$$

$$3^0 = 1 \quad 3^3 = 27$$

$$2^3 = 8 \quad 4^3 = 64$$

$$27^{2/3} = 9$$

$$2^4 = 16$$

$$w^{2/4} = w^{1/2}$$

43. Simplify each of the following expressions.

a. $7\sqrt[3]{2} - \sqrt[3]{128}$

$$7\sqrt[3]{2} - 4\sqrt[3]{2} = \boxed{3\sqrt[3]{2}}$$

(EW) $2w^3\sqrt[4]{w^2} + 2w^3\sqrt{w}$

$$2w^2\sqrt[4]{w^2} + 2w^3\sqrt[4]{w}$$

$$2w^2\sqrt{w} + 2w^3\sqrt[4]{w}$$

$$dw\sqrt{w}(w+1) \uparrow \text{skip}$$

44. Evaluate $\ln(\sqrt[9]{e})$.

$$e^? = \sqrt[9]{e}$$

$$\boxed{\frac{1}{9}}$$

$$\ln(\sqrt[9]{e}) = \frac{1}{9}$$

45. Solve the equation: $7\log_3(x-2) - 10 = 4$

$$7\log_3(x-2) - 10 = 4$$

$$\frac{7\log_3(x-2)}{7} = \frac{14}{7}$$

$$\log_3(x-2) = 2$$

$$3^2 = x-2$$

$$9 = x-2$$

$$\boxed{x=11}$$

46. What is the sum of the series $\sum_{i=1}^{33} (6-2i)$?

$$\rightarrow 4, 2, 0, -2, -4, -6, \dots$$

$$S_n = n\left(\frac{a_1 + a_n}{2}\right) = 33\left(\frac{4 + (-60)}{2}\right) = \boxed{-924}$$

47. For a certain arithmetic sequence, $a_{18} = -59$ and $a_{21} = -71$. Write an explicit rule for the n th term of the sequence.

$$a_1 - 4(17) = -59$$

$$-68 + 68$$

$$-59 + d(3) = -71$$

$$3d = -12$$

$$\boxed{a_n = 9 - 4(n-1)}$$

$$a_1 = 9$$

$$d = -4$$

48. For a certain geometric sequence, $a_2 = 28$ and $a_5 = 1792$. Write an explicit rule for the n th term of the sequence.

$$28(r)^3 = 1792$$

$$r^3 = 64 \quad r = 4$$

$$\boxed{a_n = 7(4)^{n-1}}$$

49. Convert 76° to radians.

$$\frac{76 \cdot \pi}{180} = \boxed{\frac{19\pi}{45}}$$

50. Convert $\frac{5\pi}{3}$ to degrees.

$$\frac{5\pi}{3} \cdot \frac{180}{\pi} = \boxed{300^\circ}$$