# Final Exam Answers

## Multiple Choice Answers

1. D
2. C
3. A
4. A
5. A
6. D
7. B
8. A
9. B
10. C
11. A
12. A
13. B
14. B
15. D
16. B
17. C
18. A
19. C
20. B
21. D
22. D
23. C
24. B
25. A
26. B
27. D
28. A
29. A
30. A
31. C
32. B
33. D
34. B
35. D
36. B
37. B
38. A
39. B
40. D
41. C
42. A
43. B
44. C

## Written Response Answers

**1.**

$$\begin{aligned} 4^x &= 500 \\ \log 4^x &= \log 500 \\ x\log 4 &= \log 500 \\ x &= \frac{\log 500}{\log 4} \\ x &= 4.48 \end{aligned}$$

**2.** The value $h$ is a horizontal translation parameter, and the value $k$ is a vertical translation parameter.



**3.** $h = 0$, $k = 0$, $a = 2$, $b = 3$. The graph of $y = f(x)$ is horizontally stretched about the $y$-axis by a factor of $\frac{1}{3}$ and vertically stretched about the $x$-axis by a factor of 2.

$y = f(x)$:

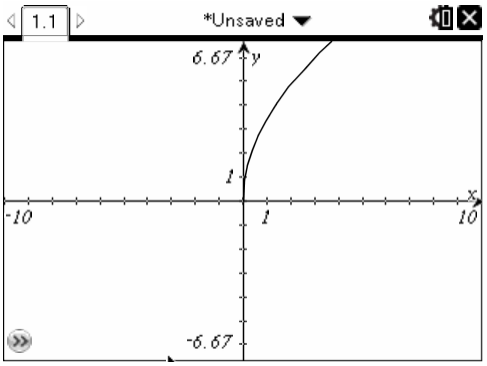
| $x$ | $y$ |
|---|---|
| 1 | 1 |
| 4 | 2 |
| 9 | 3 |

$y = f(3x)$:

| $x$ | $y$ |
|---|---|
| $\frac{1}{3}$ | 1 |
| $\frac{4}{3}$ | 2 |
| 3 | 3 |

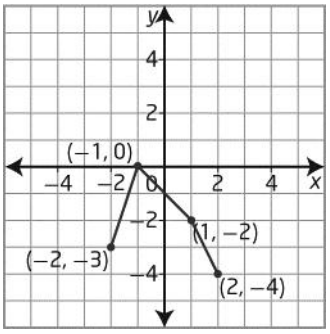
$y = 2f(3x)$:

| $x$ | $y$ |
|---|---|
| $\frac{1}{3}$ | 2 |
| $\frac{4}{3}$ | 4 |
| 3 | 6 |

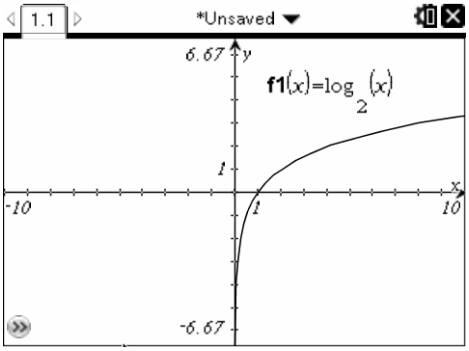



**4.** $f(x) = |x|$. Map $(x, y)$ to $(x, 2y)$ indicating a vertical stretch of factor 2 about the $x$-axis. Therefore, $g(x) = 2|x|$.

**5.**




**6.**



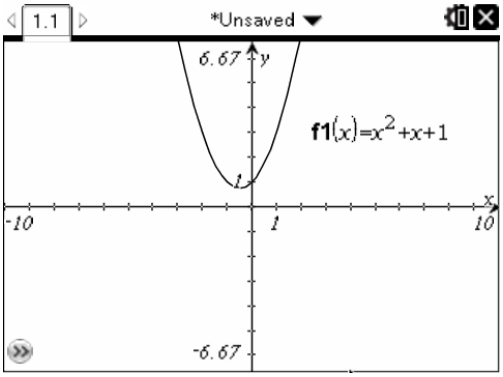

**7.** • the domain is $\{x \mid x > 0, x \in \mathrm{R}\}$
• the range is $\{y \mid y \in \mathrm{R}\}$
• the vertical asymptote is at $x = 0$
• the $x$-intercept is at (1, 0)

**8.**
$$4000 = 2000\, e^{0.015t} \quad 2 = e^{0.015t}$$
$$2 = e^{0.015t}$$
$$\ln 2 = \ln e^{0.015t}$$
$$0.693147 = 0.015t$$
$$t = 46.21$$

It will take 46.21 years to double the investment.



**9.**




• the domain is $\{x \mid x \in R\}$
• the range is $\{y \mid y \geq 0, y \in R\}$

**10.**

| | | | | |
|---|---|---|---|---|
| –2 | 2 | –1 | +3 | –2 |
| – | | –4 | –6 | –18 |
| × | 2 | 3 | 9 | 16 |

$\frac{(2x^3 - x^2 + 3x - 2)}{(x-2)} = 2x^2 + 3x + 9$, remainder 16.

Check using remainder theorem:
$P(x) = 2x^3 - x^2 + 3x - 2$
$P(2) = 2(2)^3 - 2^2 + 3(2) - 2$
$P(2) = 16$

**11.** In odd degree polynomials, the beginning and end of the function are at opposite ends of the graph. In even degree polynomials, the beginning and end of the function are at the same end of the graph.

**12.** $f(g(x)) = 2x^2 + 4$
• the domain is $\{x \mid x \in R\}$
• the range is $\{y \mid y \in R\}$
$f(2) = 2(2)^2 + 4$
$= 12$

**13.** Answers will vary. Look for examples that show that the number of combinations of $n$ items taken $r$ at a time is equivalent to the number of combinations of $n$ items taken $n - r$ at a time. Example: Find the number of permutations of two letter pairs formed out of the letters A, B, C, D.
$n = 4$ and r = 2

$${}_4P_2 = \frac{4!}{(4-2)!}$$

$${}_4P_2 = \frac{(4 \cdot 3 \cdot 2 \cdot 1)}{(2 \cdot 1)}$$

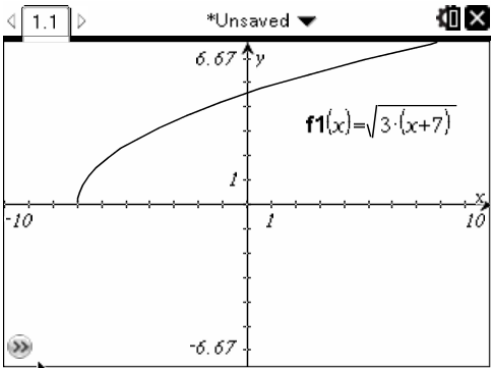
Cancelling $2 \cdot 1$ means ${}_4P_2 = 4 \cdot 3 = 12$.
This can be proven by counting the number of two-letter permutations of the letters A, B, C, D.

**14.** $1x^{4+}4x^3 3 + 6x^2 3^2 + 4x 3^3 + 1y^4$. The coefficients correspond to the 5th row of Pascal's triangle.

**15.** To find the next row, add the numbers above and to the left with the number above and to the right.

**16.** Use $y = \sqrt{x}$ . Substitute $3x$ for $x$ to get $y = \sqrt{3x}$ . Then, substitute x + 7 for x to get $y = \sqrt{(3(x+7))}$ .

This is a compression of $\frac{1}{3}$ and a translation of 7 units to the left.



**17.** $2 \cos x = 1$

$$\cos x = \frac{1}{2}$$

Using the unit circle, the general solutions are

$\frac{\pi}{3} + 2n\pi$ and $\frac{5\pi}{3} + 2n\pi$.

**18.** $120 + 360 = 480°$

$120 – 360 = –240°$

The general expression is $120 + n(360)$.