PreCalc 12 Chapter 3 Review 2017 v1
Answer Section

MULTIPLE CHOICE

1. ANS: C PTS: 1 DIF: Easy REF: 3.1 Translating Graphs of Functions
LOC: 12.RF2 TOP: Relations and Functions KEY: Conceptual Understanding

2. ANS: D

$$\left(x', y'\right) = \left(\frac{x}{b}, ay\right)$$

PTS: 1 DIF: Easy REF: 3.3 Stretching and Compressing Graphs of Functions
LOC: 12.RF3 TOP: Relations and Functions KEY: Conceptual Understanding

3. ANS: D
Swap x and y's

PTS: 1 DIF: Easy REF: 3.5 Inverse Relations
LOC: 12.RF5 | 12.RF6 TOP: Relations and Functions
KEY: Conceptual Understanding

4. ANS: C
$y - k = f(x - h)$

PTS: 1 DIF: Easy REF: 3.1 Translating Graphs of Functions
LOC: 12.RF2 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

5. ANS: B PTS: 1 DIF: Easy
REF: 3.4 Combining Transformations of Functions LOC: 12.RF4
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

6. ANS: C PTS: 1 DIF: Easy
REF: 3.4 Combining Transformations of Functions LOC: 12.RF4
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

7. ANS: A PTS: 1 DIF: Easy
REF: 3.4 Combining Transformations of Functions LOC: 12.RF4
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

8. ANS: C
$D: x_1 + h \le x \le x_2 + h$

$R: y_1 + k \le y \le y_2 + k$

PTS: 1 DIF: Moderate REF: 3.1 Translating Graphs of Functions
LOC: 12.RF2 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

9. ANS: B
$y - k = f(x - h)$

PTS: 1 DIF: Moderate REF: 3.1 Translating Graphs of Functions
LOC: 12.RF2 | 12.RF13 TOP: Transforming Graphs of Functions
KEY: Conceptual Understanding | Procedural Knowledge

10. ANS: D
a = vertical scale
b = 1 / horizontal scale

PTS: 1 DIF: Moderate REF: 3.3 Stretching and Compressing Graphs of Functions
LOC: 12.RF3 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

11. ANS: C
Domain and range are affected by reflections.

PTS: 1 DIF: Moderate REF: 3.2 Reflecting Graphs of Functions
LOC: 12.RF5 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

12. ANS: A
Let $y = f(x)$, then $y = -f(x)$.

PTS: 1 DIF: Moderate REF: 3.2 Reflecting Graphs of Functions
LOC: 12.RF5 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

13. ANS: D
Domain and range are affected by reflections.

PTS: 1 DIF: Moderate REF: 3.2 Reflecting Graphs of Functions
LOC: 12.RF5 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

14. ANS: C
$\left(x', y'\right) = \left(\frac{x}{b}, ay\right)$

PTS: 1 DIF: Moderate REF: 3.3 Stretching and Compressing Graphs of Functions
LOC: 12.RF3 | 12.RF13 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

15. ANS: C
$\left(x', y'\right) = \left(\frac{x}{b}, ay\right)$

PTS: 1 DIF: Moderate REF: 3.3 Stretching and Compressing Graphs of Functions
LOC: 12.RF3 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

16. ANS: D
Swap x and y's and solve for y.

PTS: 1 DIF: Moderate REF: 3.5 Inverse Relations
LOC: 12.RF5 | 12.RF6 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

17. ANS: D
$y - k = af(b(x - h))$

PTS: 1 DIF: Moderate REF: 3.4 Combining Transformations of Functions
LOC: 12.RF4 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

18. ANS: A

Find corresponding points and solve $x' = \frac{x}{b} + h$ and $y' = ay + k$.

PTS: 1 DIF: Moderate REF: 3.4 Combining Transformations of Functions
LOC: 12.RF4 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

19. ANS: D PTS: 1 DIF: Moderate
REF: 3.4 Combining Transformations of Functions LOC: 12.RF4
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

20. ANS: D PTS: 1 DIF: Moderate
REF: 3.4 Combining Transformations of Functions LOC: 12.RF4
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

21. ANS: B
$y - k - 2 = \sqrt{x - h - 2}$

PTS: 1 DIF: Difficult REF: 3.1 Translating Graphs of Functions
LOC: 12.RF2 | 12.RF13 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

22. ANS: D PTS: 1 DIF: Difficult
REF: 3.3 Stretching and Compressing Graphs of Functions LOC: 12.RF3
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

23. ANS: C
$(x, y) = \left(b(x' - h), \frac{y' - k}{a} \right)$

PTS: 1 DIF: Difficult REF: 3.4 Combining Transformations of Functions
LOC: 12.RF4 TOP: Relations and Functions
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SHORT ANSWER

24. ANS:
Solve by inspection. $y = f(x - h)$
$y = f(x - 3)$, -.5 if missing y=

PTS: 1 DIF: Easy REF: 3.1 Translating Graphs of Functions
LOC: 12.RF2 TOP: Relations and Functions
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25. ANS:
$y = f(x - h)$
$y = f(x + 4)$, -.5 if missing y=

PTS: 1 DIF: Easy REF: 3.1 Translating Graphs of Functions
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26. ANS:
$y - k = g(x - h)$
$y - 5 = g(x + 2)$ or $y = g(x + 2) + 5$, -.5 if missing equation

PTS: 1 DIF: Easy REF: 3.1 Translating Graphs of Functions
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27. ANS:
Substitute -x with brackets.
$y = \left|(-x)^3 - 4\right|$, -.5 if missing equation

PTS: 1 DIF: Easy REF: 3.2 Reflecting Graphs of Functions
LOC: 12.RF5 TOP: Relations and Functions KEY: Conceptual Understanding

28. ANS:
$y = 5f(x)$, -.5 if missing equation

PTS: 1 DIF: Easy REF: 3.3 Stretching and Compressing Graphs of Functions
LOC: 12.RF3 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

29. ANS:
Set $f(x) = f(-x)$ and solve for x, then solve for y.
The graphs intersect at $\left(0, \frac{1}{5}\right)$, -.5 if not coordinate.

PTS: 1 DIF: Moderate REF: 3.2 Reflecting Graphs of Functions
LOC: 12.RF5 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge | Problem-Solving Skills

30. ANS:
Choose corresponding points and solve by inspection.
$y + 3 = -(x - 5)^3$ or $y = -(x - 5)^3 - 3$, -.5 if missing equation or using *f*.

PTS: 1 DIF: Moderate REF: 3.1 Translating Graphs of Functions
LOC: 12.RF2 TOP: Relations and Functions
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31. ANS:

Use corresponding points and solve $x' = \frac{x}{b} + h$ and $y' = ay + k$.

$y = -\frac{1}{2} f(\frac{1}{2}x)$ or $g(x) = -\frac{1}{2} f(\frac{1}{2}x)$, -.5 if missing equation or not using *f*, -1 if not using algebra.

PTS: 1 DIF: Moderate REF: 3.3 Stretching and Compressing Graphs of Functions
LOC: 12.RF3 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

32. ANS:

$y - 3 = 2\left|-\frac{1}{2}(x - 4)\right|$, -.5 if using *f*.

PTS: 1 DIF: Moderate REF: 3.4 Combining Transformations of Functions
LOC: 12.RF4 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

33. ANS:

Use corresponding points and solve $x' = \frac{x}{b} + h$ and $y' = ay + k$.

The graph of $y = f(x)$ has been vertically stretched by a factor of 2, then translated 3 units left and 4 units up, -.5 not using descriptors, -1 if not using algebra.

PTS: 1 DIF: Moderate REF: 3.4 Combining Transformations of Functions
LOC: 12.RF4 | 12.RF13 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

34. ANS:

$y - 2 = \frac{1}{3}\sqrt{-4(x + 2)}$, -.5 if using *f*.

PTS: 1 DIF: Moderate REF: 3.4 Combining Transformations of Functions
LOC: 12.RF4 | 12.RF13 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

35. ANS:

Recognize that the grid points are increasing by odd numbers. So this is quadratic, then the inverse must be square root.
Equations may vary.
For example, $y = \sqrt{x + 4} - 4$, -.5 if no explanation.

PTS: 1 DIF: Moderate REF: 3.5 Inverse Relations
LOC: 12.RF5 | 12.RF6 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

36. ANS:

$y = \frac{1}{x^7}$ is an odd function because the exponent is odd, -.5 if no explanation.

PTS: 1 DIF: Difficult REF: 3.2 Reflecting Graphs of Functions
LOC: 12.RF5 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

37. ANS:

$(x, y) = \left(b(x' - h), \frac{y' - k}{a} \right)$

$(6, -3)$

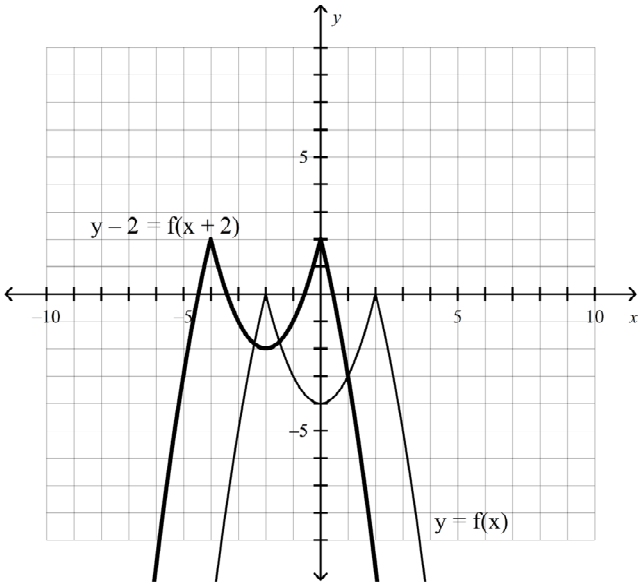
PTS: 1 DIF: Difficult REF: 3.4 Combining Transformations of Functions
LOC: 12.RF4 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge

PROBLEM

38. ANS:
-1 if missing descriptors, -1 if missing domain and range.

$y - 2 = f(x + 2)$
Compare the equation to:
$y - k = f(x - h)$
$h = -2$ and $k = 2$
The graph of $y = f(x)$ is translated 2 units left and 2 units up.

Both functions have domain: $x \in \mathbb{R}$
The range of $y = f(x)$ is: $y \leq 0$
The range of $y - 2 = f(x + 2)$ is: $y \leq 2$



PTS: 1 DIF: Moderate REF: 3.1 Translating Graphs of Functions
LOC: 12.RF2 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge | Communication

39. ANS:

$y = \frac{1}{2} f(2x)$

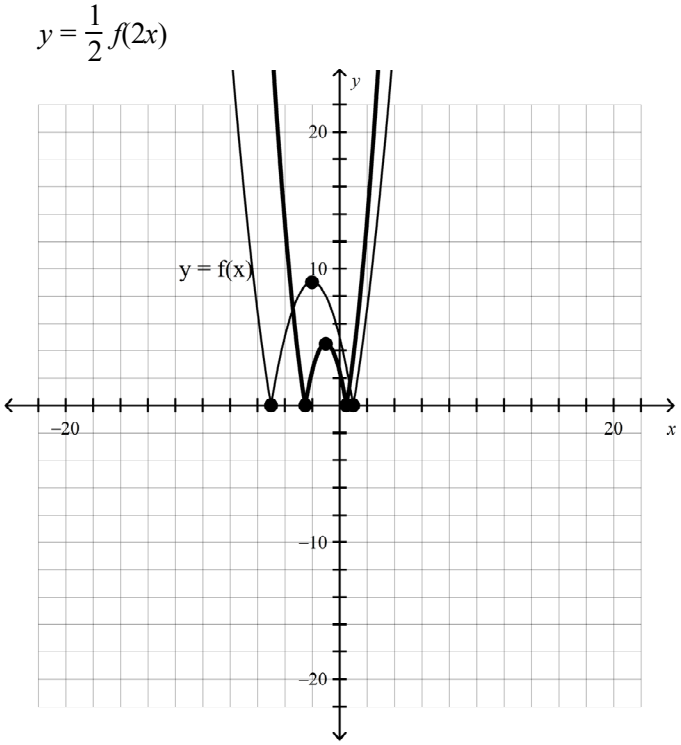
The graph of $y = f(x)$ is vertically compressed by a factor of $\frac{1}{2}$ and not reflected in the x-axis; and horizontally compressed by a factor of $\frac{1}{2}$ and not reflected in the y-axis. -1 if missing domain and range.

Point on $y = f(x)$	Point on $y = \frac{1}{2} f(2x)$
$(1,0)$	$(0.5,0)$
$(-2,9)$	$(-1,4.5)$
$(-5,0)$	$(-2.5,0)$

Plot the points, then join them with a smooth curve.

$y = f(x)$
domain: $x \in \mathbb{R}$
range: $y \geq 0$

$y = \frac{1}{2} f(2x)$
domain: $x \in \mathbb{R}$
range: $y \geq 0$



PTS: 1 DIF: Moderate REF: 3.3 Stretching and Compressing Graphs of Functions
LOC: 12.RF3 TOP: Relations and Functions
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40. ANS:
Compare $y - k = af(b(x - h))$ to
$y - 4 = \frac{1}{2} f(2(x - 3))$:
$k = 4, a = \frac{1}{2}, b = 2, h = 3$

The graph of $y = f(x)$ has been vertically compressed by a factor of $\frac{1}{2}$, horizontally compressed by a factor of $\frac{1}{2}$, not reflected, then translated 3 units right and 4 units up.

PTS: 1 DIF: Moderate REF: 3.4 Combining Transformations of Functions
LOC: 12.RF4 TOP: Relations and Functions
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41. ANS:
Write the equation of the image graph in the form $y - k = af(b(x - h))$.
$A(0, 0)$, $A'(-3, -3)$, $B(4, 2)$, $B'(-1, -4)$

Solve using $x' = \frac{x}{b} + h$ and $y' = ay + k$

Using A and A': $-3 = \frac{0}{b} + h$

Using B and B': $-1 = \frac{4}{b} + h$

Solve for b and h.
Using A and A': $-3 = a(0) + k$
Using B and B': $-4 = a(2) + k$
Solve for a and k.
$y + 3 = -\frac{1}{2} f(2(x + 3))$, -1 if not using algebra, -.5 if not equation and/or not using f..

PTS: 1 DIF: Moderate REF: 3.4 Combining Transformations of Functions
LOC: 12.RF4 TOP: Relations and Functions
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42. ANS:

The equation of the translation image has the form
$y - k = -5x^2 - 10x - 16$, or $y = -5x^2 - 10x - 16 + k$.

The vertex lies on the x-axis when the value of the discriminant is 0.
In $b^2 - 4ac$, substitute: $a = -5$, $b = -10$, $c = -16 + k$

$$0 = b^2 - 4ac$$

$$0 = (-10)^2 - 4(-5)(-16 + k)$$

$$0 = 100 - (-20)(-16 + k)$$

$$(-20)(-16 + k) = 100$$

$$k = \frac{100}{-20} - (-16)$$

$$k = 11$$

So, the translation is 11 units up.
-1 if not using algebra. Solution 2 is to complete the square to determine the vertex.

PTS: 1 DIF: Difficult REF: 3.1 Translating Graphs of Functions
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43. ANS:
Given $y = dx + 3$, interchange x and y.
$x = dy + 3$

$$y = \frac{x - 3}{d}$$

This equation must be the same as $y = dx + 3$.
Compare like terms.
$\frac{x}{d} = dx$, so $d = 1$ or $d = -1$
$\frac{-3}{d} = 3$, so $d = -1$

The value of d is -1. -1 if not using algebra.

PTS: 1 DIF: Difficult REF: 3.5 Inverse Relations
LOC: 12.RF5 | 12.RF6 TOP: Relations and Functions
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