Thursday, January 25, 2018
6:18 PM

Precalculus -- Midterm 2018 Review #1 KEY

Name ______________________ Date ______________ Period ______________

1. Given $f(x)=x^2-2x+1$, find $f(x-3)$.

$(x-3)^2-2(x-3)+1 = (x-3)(x-3)-2x+6+1$

$= x^2-3x-3x+9-2x+7$

$= \boxed{x^2-8x+16}$

*DO NOT FACTOR - it is simplified!

2. Find the domain of $h(x)=\dfrac{\sqrt{x}}{x-6}$.

$\sqrt{x} \leftarrow x \ge 0$

$x-6 \neq 0$

$x \neq 6$

0 6 7

$\boxed{[0,6)\cup(6,\infty)}$

3. Find the domain of $g(x)=\sqrt{36+2x}$.

$36+2x \ge 0$

$2x \ge -36$

$x \ge -18$

$\boxed{[-18,\infty)}$

−18

4. Sketch the graph of $f(x)=-x^3+2$. Give the domain and range in interval notation.

① ②

Parent $P(x)=x^3$

D: $(-\infty,\infty)$

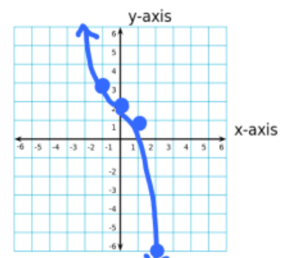
R: $(-\infty,\infty)$

x	y
-2	-8
-1	-1
0	0
1	1
2	8

② Shift up 2

① Reflect over x-AXIS

x	(y)(-1)	y+2
-2	8	10
-1	1	3
0	0	2
1	-1	1
2	-8	-6



5. Use the graph of $h(x)=|x|$ to graph the following: (a) $h(x+4)$ (b) $h(-x)+1$

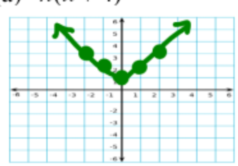
$P(x)=|x|$ parent

x	y
-2	2
-1	1
0	0
1	1
2	2

a)

*Shift 4 left

b)



Reflect over y-AXIS

Shift up 1

6. Given $f(x)=3x+7$ and $g(x)=2x^2-5$, find the following: (a) $(g-f)(x)$ (b) $(f\cdot g)(x)$ "FOIL"

a) $g(x)-f(x) = 2x^2-5-(3x+7)$

$= 2x^2-5-3x-7$

$= \boxed{2x^2-3x-12}$

b) $f(x)\cdot g(x) = (3x+7)(2x^2-5)$

$= 6x^3-15x+14x^2-35$

$= \boxed{6x^3+14x^2-15x-35}$

7. Given $r(x)=x^2-2x+16$ and $s(x)=2x+3$, find $r(s(x))$.

$r(2x+3) = (2x+3)^2-2(2x+3)+16$

$= (2x+3)(2x+3)-4x-6+16$

$= 4x^2+6x+6x+9-4x+10 = \boxed{4x^2+8x+19}$

8. Given $f(x)=x^3+7$, find $f^{-1}(x)$.

$y=x^3+7$

$x=y^3+7$

$x-7=y^3$

$y=\sqrt[3]{x-7}$

$\boxed{f^{-1}(x)=\sqrt[3]{x-7}}$

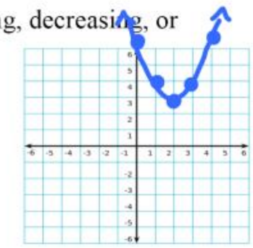
*switch x & y

*Solve for y

*parabola
*vertex: (2,3)
* graph 1st!

9. Determine the intervals over which the function $f(x) = (x-2)^2 + 3$ is increasing, decreasing, or constant.

increasing: $(2, \infty)$
decreasing: $(-\infty, 2)$



10. Determine whether the following functions are even, odd, or neither:

(a) $g(x) = x^5 + 4x - 7$

$g(-x) = (-x)^5 + 4(-x) - 7$
$= -x^5 - 4x - 7$

$\boxed{\text{Since } g(-x) \neq -g(x) \text{ and } \neq g(x), \text{ the function is neither}}$

(b) $h(x) = 3x^4 - 21x^2$

$h(-x) = 3(-x)^4 - 21(-x)^2$
$= 3x^4 - 21x^2$

$\boxed{\text{Since } h(-x) = h(x) \text{ the function is even.}}$

11. *Verify algebraically*, that $f(x) = 3x^5 + 2$ and $g(x) = \sqrt[5]{\dfrac{x-2}{3}}$ are inverse functions.

$f(g(x)) = f\left(\sqrt[5]{\frac{x-2}{3}}\right) = 3\left(\sqrt[5]{\frac{x-2}{3}}\right)^5 + 2 = 3\left(\frac{x-2}{3}\right) + 2 = x - 2 + 2 = x$ ✓

$g(f(x)) = g(3x^5 + 2) = \sqrt[5]{\frac{3x^5 + 2 - 2}{3}} = \sqrt[5]{\frac{3x^5}{3}} = \sqrt[5]{x^5} = x$ ✓

since $f(g(x)) = x$ and $g(f(x)) = x$, the functions are inverses.

12. True/False: if a function has an inverse then it must pass both the vertical and horizontal line tests.

TRUE! If a relation is a function, it passes the vertical line test.
If it has an inverse function, then it passes the horizontal line test.
If both are true, it is ONE-TO-ONE.

13. Express 350° in radian measure.

$35\cancel{0}^\circ \cdot \dfrac{\pi \text{ radians}}{18\cancel{0}^\circ} = \boxed{\dfrac{35\pi}{18}}$

14. Find one positive and one negative coterminal angle to $\dfrac{2\pi}{9}$.

* Add and subtract multiples of 2π

$\dfrac{2\pi}{9} + 2\pi \cdot \dfrac{9}{9} = \dfrac{2\pi}{9} + \dfrac{18\pi}{9} = \boxed{\dfrac{20\pi}{9}}$

$\dfrac{2\pi}{9} - 2\pi \cdot \dfrac{9}{9} = \dfrac{2\pi}{9} - \dfrac{18\pi}{9} = \boxed{\dfrac{-16\pi}{9}}$

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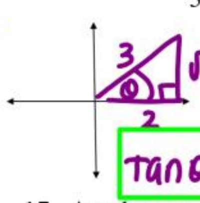
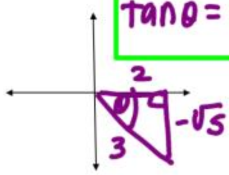
15. If $\cos\theta = \dfrac{2}{3}$, $0 \le \theta < 2\pi$, find all values of $\tan\theta$.

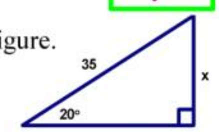


$\boxed{\tan\theta = \dfrac{\sqrt{5}}{2}}$



$\boxed{\tan\theta = -\dfrac{\sqrt{5}}{2}}$

16. Solve for x in the given figure.



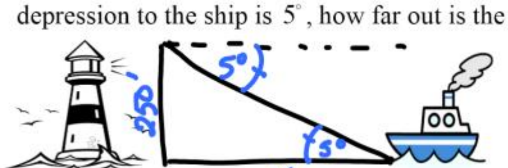
$\sin 20^\circ = \dfrac{x}{35}$

$35 \sin 20^\circ = x$

$\boxed{x = 11.97}$

* degree mode!

17. An observer in a lighthouse 250 feet above sea level spots a ship off the shore. If the angle of depression to the ship is 5°, how far out is the ship?



$\tan 5^\circ = \dfrac{250}{x}$

$x \tan 5^\circ = 250$

$x = \dfrac{250}{\tan 5^\circ} = \boxed{2857.51 \text{ ft.}}$

18. Convert $135^\circ 14' 12''$ to decimal form.

$\boxed{\approx 135.24^\circ}$