Tuesday, November 14, 2017
6:40 PM

KEY

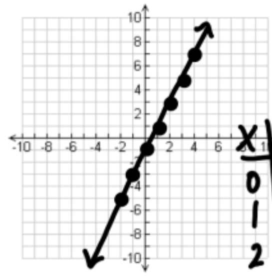
Quarterly 1 Review #2 Chapter 1.4–1.9, 4.1

Review the following in preparation for the quarterly. You will be permitted to use a graphing calculator.

1. Test on 1.4–1.9 2. Quiz 4.1 3. Complete the quarterly review below

DO ALL WORK ON A SEPARATE SHEET OF PAPER!!

Use $f(x)=2x-1$ for questions #1 & 2.



x	y
0	-1
1	1
2	3

(-1)

x	y
0	-1
-1	1
-2	3

(-1)

x	y
0	1
1	-1
2	-3

1. Write the function:

a. $g(x)$, that is the reflection of $f(x)$ in the y-axis.

$g(x) = 2(-x)-1 = -2x-1$

b. $h(x)$, that is the reflection of $f(x)$ in the x-axis.

$h(x) = -(2x-1) = -2x+1$

2. Write the function $g(x)$, that shows a vertical shift of 3 up and a horizontal shift of 5 left for $f(x)$.

$g(x) = 2(x+5)-1+3 = 2(x+5)+2 = 2x+10+2$

$\boxed{g(x) = 2x+12}$

3. How do you determine if a relation is a function?

Each input must have exactly one output.
graphically: vertical line test Algebraically: solve for y. (no $\pm$)

If a relation is one-to-one?

Each output must have exactly one input.
graphically: horizontal line test.

4. If $f(x)=2x^3-1$, find the inverse and graph both the function and the inverse on the same set of axes.

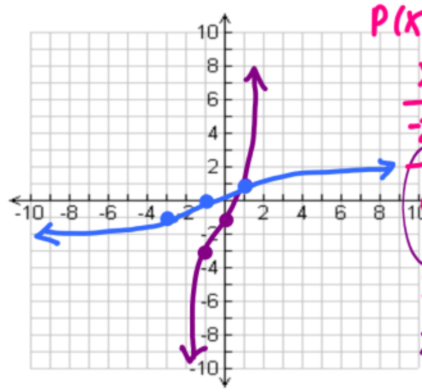
$y = 2x^3-1$

$x = 2y^3-1$

$\frac{x+1}{2} = \frac{2y^3}{2}$

$y = \sqrt[3]{\frac{x+1}{2}}$

$\boxed{f^{-1}(x) = \sqrt[3]{\frac{x+1}{2}}}$



$P(x)=x^3$ $f(x)$ $f^{-1}(x)$

x	y	y(2)	y-1
-2	-8	-16	-17
-1	-1	-2	-3
0	0	0	-1
1	1	2	1
2	8	16	15
x			y

x	y
-3	-1
-1	0
1	1

5. Algebraically determine if $f(x)=3x^4-5x^2+1$ is even, odd, or neither and identify any symmetry.

$f(-x) = 3(-x)^4-5(-x)^2+1$
$= 3x^4-5x^2+1$
$= f(x)$

$\boxed{\text{even, symmetric about the y-Axis.}}$

6. If $f(x) = 2x^2 - 3$ and $g(x) = x + 5$, find:

a. $(f \circ g)(-1)$

$f(g(-1))$

$g(-1) = -1 + 5 = 4$

$f(4) = 2(4)^2 - 3 = 2(16) - 3$

$= 32 - 3 = \boxed{29}$

b. $(g \circ f)(x)$, state the domain

$g(f(x)) = g(2x^2 - 3) =$

$2x^2 - 3 + 5 = \boxed{2x^2 + 2}$

$\boxed{D: (-\infty, \infty)}$

c. $\left(\frac{f}{g}\right)(x)$, state the domain

$\frac{f(x)}{g(x)} = \boxed{\frac{2x^2 - 3}{x + 5}}$ ← $x \neq -5$

$\boxed{D: (-\infty, -5) \cup (-5, \infty)}$

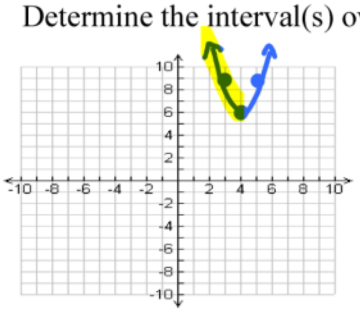
d. $(f - g)(x) = f(x) - g(x)$

$= 2x^2 - 3 - (x + 5)$

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

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

7. Determine the interval(s) over which the function $f(x) = 3(x-4)^2 + 6$ is decreasing.



$\boxed{(-\infty, 4)}$

8. Identify the domain of each function:

a. $f(x) = x^2 + 2x + 4$

$\boxed{(-\infty, \infty)}$

b. $f(x) = \sqrt{x + 6} - 2$

$x + 6 \geq 0$

$x \geq -6$

$\boxed{[-6, \infty)}$

c. $h(x) = \frac{3x}{x - 5}$ ← $x \neq 5$

$\boxed{(-\infty, 5) \cup (5, \infty)}$

d. $k(x) = \frac{2}{\sqrt{x + 6}}$ ← $x + 6 > 0$

$x > -6$

$\boxed{(-6, \infty)}$

9. Find the zeros of the function:

a. $f(x) = \underline{4x^3 - 24x^2} \underline{- x + 6}$

$4x^2(x - 6) - 1(x - 6)$

$(4x^2 - 1)(x - 6) = 0$

$(2x + 1)(2x - 1)(x - 6) = 0$

$\boxed{x = -1/2, 1/2, 6}$

b. $f(x) = 2x^2 - 7x - 30$

-60
5 -12
-7

$\underline{2x^2 + 5x} \underline{- 12x - 30}$

$x(2x + 5) - 6(2x + 5)$

$(x - 6)(2x + 5) = 0$

$\boxed{x = 6 \quad x = -5/2}$

10. Determine whether the function is even, odd, or neither and describe the symmetry that exists, if any.

a. $g(x) = x^2 - 4x + 5$

$g(-x) = (-x)^2 - 4(-x) + 5$
$= x^2 + 4x + 5$
$\neq g(x) \quad \neq -g(x)$

$\boxed{\text{neither, no symmetry}}$

b. $f(x) = x^3 - 5x$

$f(-x) = (-x^3) - 5(-x)$
$= -x^3 + 5x$
$= -f(x)$

$\boxed{\text{ODD, symmetric about the origin.}}$

c. $j(x) = x^4 - 5x^2 - 3$

$j(-x) = (-x)^4 - 5(-x)^2 - 3$
$= x^4 - 5x^2 - 3$
$= j(x)$

$\boxed{\text{Even, symmetric about y-Axis.}}$

11. If $f(x) = 3\sqrt{2x}$ and $g(x) = x - 1$, find $g(f(x))$.

$g(3\sqrt{2x}) = \boxed{3\sqrt{2x} - 1}$.

12. Describe all of the transformations from the parent function for the following function:

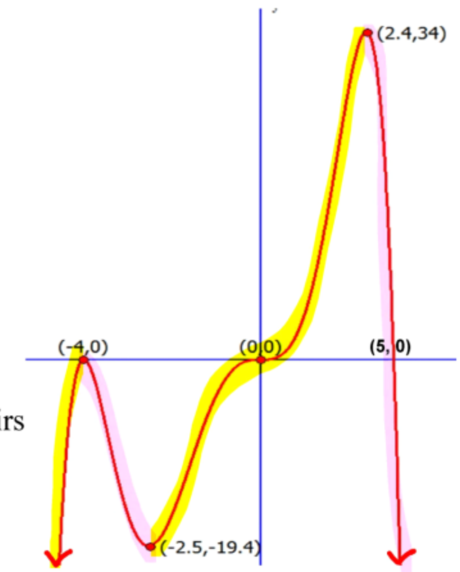
FACTOR OUT "–"

$d(x) = -3(-x-4)^2 - 8 \quad = -3(-(x+4))^2 - 8$

③ ① ② ④

① Reflect over y-Axis
② Shift 4 units left
③ Reflect over x-Axis, vertical stretch by 3
④ Shift 8 units down

13. Analyze the function pictured. Include the following:



a. Domain & Range:

D: $(-\infty, \infty)$ R: $(-\infty, 34]$

b. Inc/dec/constant intervals:

INC: $(-\infty, -4) \cup (-2.5, 2.4)$
Dec: $(-4, -2.5) \cup (2.4, \infty)$

c. Find the zero(s). State your answer(s) as ordered pairs

$(-4, 0)$, $(0,0)$, $(5, 0)$

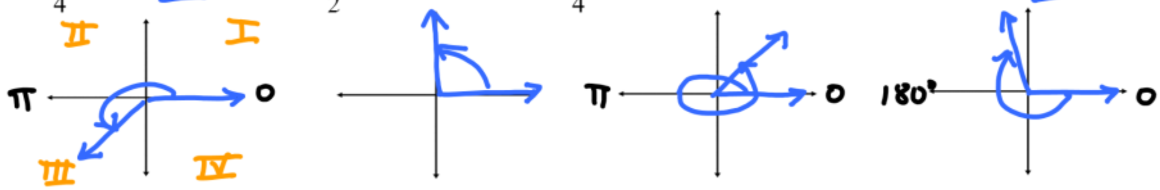
d. Find the relative minimum(s)/maximum(s).

Rel. min: $(-2.5, -19.4)$

Rel. max: $(-4, 0)$, $(2.4, 3.4)$

14. Determine the quadrant in which the terminal side of an angle of this size lies.

$\frac{5\pi}{4}$ ___III___ $\frac{\pi}{2}$ ___none___ $\frac{9\pi}{4}$ ___I___ $-222°$ ___II___



15. List one positive and one negative coterminal angle for each of the following angles:

108° ________ 216° ________ $\frac{5\pi}{3}$ ________ $-340°$ ________

$108° + 360° = \boxed{468°}$

$108° - 360° = \boxed{-252°}$

$216° + 360° = \boxed{576°}$

$216° - 360° = \boxed{-144°}$

$\frac{5\pi}{3} + 2\pi \cdot \frac{3}{3} =$

$\frac{5\pi}{3} + \frac{6\pi}{3} = \boxed{\frac{11\pi}{3}}$

$\frac{5\pi}{3} - \frac{6\pi}{3} = \boxed{-\frac{\pi}{3}}$

$-340° + 360° = \boxed{20°}$

$-340° - 360° = \boxed{-700°}$

16. Determine supplementary angles for: (ADD to π or 180°, Both must be pos.)

$\theta = \frac{3\pi}{4}$ ________ $\theta = 230°$ ___none___ $\theta = 15°$ ________ $\theta = \frac{5\pi}{4}$ ___none___

$\frac{4}{4}\pi - \frac{3\pi}{4} = \frac{4\pi}{4} - \frac{3\pi}{4}$

$= \boxed{\frac{\pi}{4}}$

$180° - 230° =$

$-50°$

none - must be positive

$180° - 15° =$

$\boxed{165°}$

$\frac{4}{4}\pi - \frac{5\pi}{4} = -\frac{\pi}{4}$

none - must be positive

17. Determine complementary angles for: (ADD to $\frac{\pi}{2}$ or 90°, both must be pos.)

$\theta = \frac{3\pi}{5}$ ___none___ $\theta = 21°$ ________ $\theta = 37°$ ________

$\frac{5}{5}\frac{\pi}{2} - \frac{3\pi}{5} \cdot \frac{2}{2} = \frac{5\pi}{10} - \frac{6\pi}{10}$

$= -\frac{\pi}{10}$

$90° - 21° = \boxed{69°}$

$90° - 37° = \boxed{53°}$

18. Convert the following angles to degrees:

$\theta = \frac{3\pi}{5}$ ________ $\theta = \frac{3\pi}{4}$ ________

$\frac{3\pi}{5} \cdot \frac{180°}{\pi \text{ radians}} = \frac{540°}{5} = \boxed{108°}$

$\frac{3\pi}{4} \cdot \frac{180°}{\pi \text{ radians}} = \frac{540°}{4} = \boxed{135°}$

19. Convert to (degree) decimal form. Round to 3 decimal places:

23° 17' 29" ___23.291°___ $-14°$ 14' 14" ___-14.237___

* use graphing calculator :
* 2nd angle for °, '
* Alpha, + for "

20. Convert the angle measures from degrees to radians or radians to degrees – round to 3 decimal places.

485° ______ | $\frac{5\pi}{3}$ ______ | $\frac{7\pi}{6}$ ______ | $-33^\circ\ 15'$ ______

$485^\circ \cdot \frac{\pi \text{ radians}}{180^\circ} = \boxed{\frac{97\pi}{36}}$

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

$\frac{7\pi}{6} \cdot \frac{180^\circ}{\pi \text{ rad.}} = \boxed{210^\circ}$

$-33.25^\circ \cdot \frac{\pi \text{ rad}}{180^\circ} = \boxed{\frac{-133\pi}{720}}$

21. What is the central angle θ of a circle with radius 7.5 inches that subtends an arc of 22 in.?

$\theta_{radians} = \frac{s}{r}$ $\theta = \frac{22\cancel{in}}{7.5\cancel{in}} = \boxed{2.9\overline{33} \text{ radians}}$ or $\boxed{\frac{44}{15} \text{ radians}}$

22. What is the arc length intercepted by a central angle of 20° with a radius of 8 cm?

* Convert to radians 1st!

$20^\circ \cdot \frac{\pi \text{ rad.}}{180^\circ} = \frac{\pi}{9}$

$\theta = \frac{s}{r}$

$\frac{\pi}{9} = \frac{s}{8cm}$

$\frac{8\pi cm}{9} = \frac{9s}{9}$

$\rightarrow s = \boxed{\frac{8\pi}{9} cm}$ or $\boxed{2.793 \text{ cm}}$

23. What is the area of a sector of radius 10 inches and central angle of $\theta = 25^\circ$? ______

$A = \frac{1}{2} r^2 \theta$

* θ must be in radians!

$25^\circ \cdot \frac{\pi \text{ rad.}}{180^\circ} = \frac{5\pi}{36}$

$A = \frac{1}{2}(10 \text{ in.})^2 \cdot \frac{5\pi}{36}$

$= 50 \text{ in. sq.} \cdot \frac{5\pi}{36}$

$= \boxed{\frac{125\pi}{18} \text{ sq inches}}$ or $\boxed{21.817 \text{ sq. inches}}$