Name:_____ *Key*_____

MA131/135: College Algebra
Instructor: Justin Ryan
Midterm Exam 1—Sections 1.1–1.5, and 2.1–2.3

Read and follow all instructions.

Part I: True or False [5 points each]
Read each statement carefully. In the space provided, write **T** *if the statement is* <u>always</u> *true, or* **F** *otherwise.*

___F___ **1.** Two lines are perpendicular if their slopes are reciprocals of one another.

Slopes are <u>opposite</u> reciprocals.

___T___ **2.** The line $5x + 10y = 8$ has a slope of $-\frac{1}{2}$.

$y = -\frac{1}{2}x + \frac{4}{5}$

___T___ **3.** The vertex of $y = x^2 + 2x - 1$ is $(-1, -2)$.

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

___T___ **4.** The lines $y = 2x - 5$ and $4x - 2y = 12$ are parallel.

$y = 2x - 6$

Part II: Fill in the Blank [5 points each]
Choose the appropriate word or phrase from the word bank, and write its corresponding letter in the space provided.

Word Bank:

A. Point-Slope   **B.** Reflection   **C.** Right

D. Skew   **E.** x-axis   **F.** y-axis

G. Down   **H.** Left   **I.** Slope-Intercept

J. Standard   **K.** Rotational   **L.** Up

___F___ **5.** The graph of the function $f(x) = 13x^4 - 5x^2 + 7$ has _____ symmetry.

___A___ **6.** "$y - y_1 = m(x - x_1)$" is called the _____ form of the equation of a line.

___H___ **7.** The graph of the function $f(x) = (x + 3)^3$ is obtained by shifting the graph of the parent function _____ 3 units.

___K___ **8.** If a function f is odd, then its graph has _____ symmetry.

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Part III: Multiple Choice [5 points each]
Write the letter corresponding to the appropriate answer in the space provided.

C **9.** Find an equation of the line passing through the points $P(2,4)$ and $Q(-2,6)$.

A. $y = -2x + 8$ **B.** $y = 2x$ $m = \frac{6-4}{-2-2} = \frac{2}{-4} = -\frac{1}{2}$

C. ~~$y = 2x + 8$~~   **D.** $y = -\frac{1}{2}x + 3$ $y = 4 - \frac{1}{2}(x-2)$
$y = -\frac{1}{2}x + 5$

$y = 4 - \frac{1}{2}x + 1$

$y = -\frac{1}{2}x + 5$

D **10.** The graph of $y = \sqrt{x}$ is reflected over the y-axis, then stretched vertically by a factor of 2, then shifted down 3 units and left 1 unit. Give an equation of the function defined by the resulting graph.

A. $f(x) = -\sqrt{2x+2} - 3$ **B.** $f(x) = -2\sqrt{x+1} - 3$

C. $f(x) = 2\sqrt{-x-3} - 1$ **D.** $f(x) = 2\sqrt{-x + 1} - 3$

In order:
$f_1(x) = \sqrt{-x}$
$f_2(x) = 2\sqrt{-x}$
$f_3(x) = 2\sqrt{-(x+1)}$
$\quad = 2\sqrt{-x-1}$
$\boxed{f_4(x) = 2\sqrt{-x-1} - 3}$

A **11.** Find the distance between the points $P(14,10)$ and $Q(8,18)$.

A. 10   **B.** 100

C. $\sqrt{28}$ **D.** $(11,14)$

$d(P,Q) = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$
$= \sqrt{(14-8)^2 + (10-18)^2}$
$= \sqrt{6^2 + (-8)^2}$
$= \sqrt{36 + 64}$
$= \sqrt{100}$
$= 10$

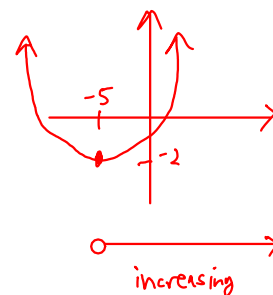**A** **12.** On what interval is the function $f(x) = (x+5)^2 - 2$ increasing?

A. $(-5, \infty)$ **B.** $(-\infty, -5)$

C. $(-\infty, -2)$ **D.** $(-2, -\infty)$

The graph looks like:

increasing

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A **13.** What type of discontinuity, if any, does the function $f(x) = \dfrac{x^3 + 1}{x + 1}$ have at the point $x = -1$?

$f(x) = \dfrac{x^3 + 1}{x + 1}$

$= \dfrac{(x+1)(x^2 - x + 1)}{x+1}$

A. hole　　　　　　　B. jump

C. vertical asymptote　　D. none

$= x^2 - x + 1, \quad x \neq -1$

hole!

C **14.** What is the domain of the function $f(x) = \dfrac{1}{\sqrt{x - 2}}$?

A. $(-\infty, 2]$　　　　B. $[2, \infty)$

C. $(2, \infty)$　　　　D. $(-\infty, 2)$

$x - 2 > 0$

$x > 2$

D **15.** Describe how the graph of $y = (x + 5)^3 + 2$ is obtained from the graph of the parent function.

A. left 5, down 2　　B. right 5, up 2

C. right 5, down 2　　D. shift left 5 and up 2

A **16.** The function $f(x) = \dfrac{x^3 - x}{2x^5 - 3x}$ is...

A. even　　　　　　B. odd

C. neither　　　　　D. I have no idea dude.

$f(-x) = \dfrac{(-x)^3 - (-x)}{2(-x)^5 - 3(-x)} = \dfrac{-x^3 + x}{-2x^5 + 3x} = \dfrac{-(x^3 - x)}{-(2x^5 - 3x)} = \dfrac{x^3 - x}{2x^5 - 3x} = f(x).$ EVEN

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Part IV: Short Answer [10 points each]

Show enough work. Clearly mark your final answers. Partial credit given when deserved.

17. The following graph defines a function, $y = f(x)$. Use the graph to (a) identify the parent function, (b) list all transformations (in an acceptable order), and then (c) write an equation of the function.
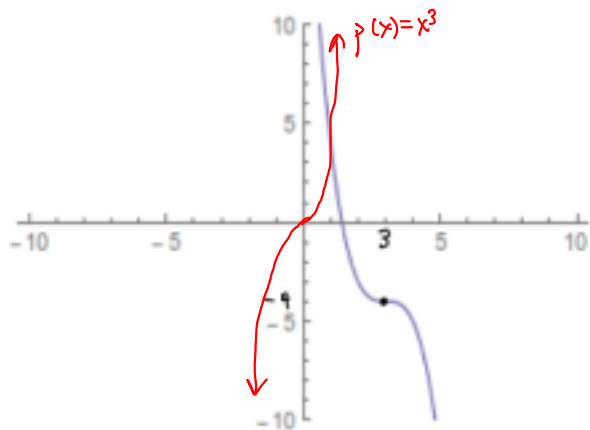
parent: $p(x) = x^3$

transformations: reflect over X-axis

down 4

right 3

Equation: $\boxed{f(x) = -(x-3)^3 - 4}$

18. Find an equation of the line passing through the point $P(1, -2)$ and parallel to the line $6x - 12y = 36$.

$6x = 12y + 36$

$12y = 6x - 36$

$y = \left(\dfrac{1}{2}\right)x - 3$

$m = \dfrac{1}{2}$

$y - y_1 = m(x - x_1)$

$y + 2 = \dfrac{1}{2}(x - 1)$

$y = \dfrac{1}{2}x - \dfrac{1}{2} - \dfrac{2 \cdot 2}{2}$

$\boxed{y = \dfrac{1}{2}x - \dfrac{5}{2}}$

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