MATH 1200 **Spring 2017 Exam 3A** **Name:** Key

Show **all your work** to get full/ partial credit. Each problem is worth 5 points.

1. Write the equation of the line passing through the points $(2, -5)$ and $(7, -3)$

slope: $m = \dfrac{-3-(-5)}{7-2} = \dfrac{2}{5}$

equation: $y-(-5) = 2/5\,(x-2)$

$y+5 = 2/5\,x - 4/5$

$y = 2/5\,x - 4/5 - \underbrace{\tfrac{5}{1}\cdot\left(\tfrac{5}{5}\right)}_{\frac{25}{5}}$

$\boxed{y = 2/5\,x - 29/5}$

2. Write the given equation in *slope – intercept* form, $3x + 4y = 4$

$4y = -3x + 4$

$\boxed{y = -\frac{3}{4}x + 1}$

3. Given the function defined by $f(x) = x^2 + 2$, determine the average rate of change from $x_1 = -3$ to $x_2 = 0$

↳ $\dfrac{f(x_2) - f(x_1)}{x_2 - x_1}$

$f(x_2) = f(0) = 0^2 + 2 = 2$

$f(x_1) = f(-3) = (-3)^2 + 2 = 9 + 2 = 11$

average rate of change: $\dfrac{f(x_2) - f(x_1)}{x_2 - x_1} = \dfrac{2-11}{0-(-3)} = \dfrac{-9}{3} = \boxed{-3}$

4. Write an equation of the line passing through the point $(-8, -4)$ and perpendicular to the line defined by $\underbrace{y = \frac{1}{6}x + 3}_{\text{equation 1}}$

Slope of equation 1: $m_1 = \frac{1}{6}$

perpendicular slope: $m_2 = -6$

equation 2: $y-(-4) = -6\,(x-(-8))$

$y+4 = -6\,(x+8)$

$y+4 = -6x - 48$

$y = -6x - 48 - 4$

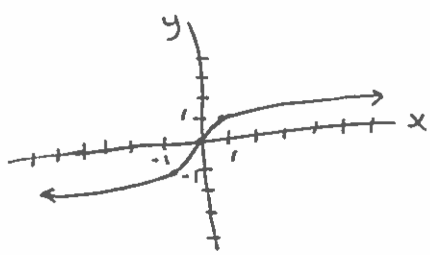
$\boxed{y = -6x - 52}$

5. A speeding ticket is \$100 plus \$5 for every 1 *mph* over the speed limit. Write a linear function to model the cost $S(x)$ $(in\ \$)$ of a speeding ticket for a person caught driving at x *mph* over the speed limit

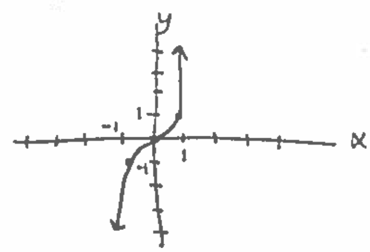
$S(x) = 5x + 100$

6. Sketch the graph of the following functions.

a. $f(x) = \sqrt[3]{x}$



b) $f(x) = x^3$



7. Given the function defined by $g(x) = -\sqrt{x+2} - 3$

a. Write the parent function of $g(x)$

parent function: $y = \sqrt{x}$

b. Describe the translation of the function $g(x)$.

1) Horizontal shift left 2
2) Reflect over x-axis
3) Vertical shift down 3

8. Determine if the function is even or odd

a. $f(x) = -x^3 + x$

$F(-x) = -(-x)^3 + (-x)$
$= x^3 - x$
$\neq F(x)$

not even.

$-F(x) = -(x^3 - x)$
$= -x^3 + x$
$= F(x)$

odd

b) $g(x) = x^2 - |x| + 1$

$g(-x) = (-x)^2 - |-x| + 1$
$= x^2 - |x| + 1$
$= g(x)$

even

9. Evaluate $f(-1)$ if $f(x) = \begin{cases} -x^2, & x < 0 \\ x+1, & x \geq 0 \end{cases}$ ← use this piece since $-1<0$

$f(-1) = -(-1)^2$

$\boxed{= -1}$

10. Given $f(x) = |x-3|$ and $g(x) = \frac{1}{x+1}$, evaluate $(f+g)(0)$.

$(f+g)(0) = f(0) + g(0)$

$= |0-3| + \frac{1}{0+1}$

$= |-3| + \frac{1}{1}$

$= 3 + 1$

$\boxed{= 4}$

11. Given $f(x) = 3x + 4$ and $g(x) = \frac{1}{x-1}$.

a. Determine $(f \circ g)(x)$

$(f \circ g)(x) = f(g(x))$

$= f\left(\frac{1}{x-1}\right)$

$= 3\left(\frac{1}{x-1}\right) + 4$

$\boxed{= \frac{3}{x-1} + 4}$

b. State the domain of *(a)* in interval notation.

Domain: $(-\infty, 1) \cup (1, \infty)$

12. Given $f(x) = 4x - 2$,

a. Find $f(x+h)$

$f(x+h) = 4(x+h) - 2$

$= 4x + 4h - 2$

b) find the difference quotient, $\frac{f(x+h)-f(x)}{h}$

$\frac{f(x+h) - f(x)}{h} = \frac{4x+4h-2-(4x-2)}{h}$

$= \frac{\cancel{4x}+4h-\cancel{2}-\cancel{4x}+\cancel{2}}{h}$

$= \frac{4\cancel{h}}{\cancel{h}}$

$\boxed{= 4}$

13. Given $f(x) = 3x^2 + 12x + 5$

$n = \left(\frac{b}{2}\right)^2 = \left(\frac{4}{2}\right)^2 = 2^2 = 4$

a. Write $f(x)$ in vertex form.

$f(x) = 3(x^2 + 4x \quad) + 5$

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

$= 3(x^2 + 4x + 4) - 12 + 5$

$\boxed{= 3(x+2)^2 - 7}$

vertex: $(-2, -7)$

b. Determine the axis of symmetry of $f(x)$.

$x = -2$

14. Use the leading term to sketch the end behavior of the function

$g(x) = \frac{6}{7}(x-9)^2(x+4)^2(3x-5)$

leading term: $\frac{6}{7}(x)^2(x)^2(3x) = \frac{18}{7}x^5$

$\downarrow \quad \uparrow$

down left

up right

15. For $f(x) = 2x^6 - 14x^4$

a. Find the zeros of $f(x)$

$0 = 2x^6 - 14x^4$

$0 = 2x^4(x^2 - 7)$

$0 = 2x^4$

$\boxed{x = 0}$

$0 = x^2 - 7$

$7 = x^2$

$\boxed{\pm\sqrt{7} = x}$

b. State the multiplicities of the zeros of $f(x)$

$x = 0$ multiplicity of 4

$x = \sqrt{7}$ multiplicity of 1

$x = -\sqrt{7}$ multiplicity of 1