Math 75 **Maria Voloshina**

Practice test 1

The actual exam will consist of 6 multiple choice questions and 6 regular problems. You will have 1 hour to complete the exam.

Multiple choice questions: circle the correct answer

1. The function $f(x) = \sin(x) + x^2$ is
   A. even **B.** odd **C.** periodic with period 2π **D.** discontinuous at 0
   E. None of the above

2. If we shift the graph of $y = \sin(x)$ 2 units to the left, then the equation of the new graph is
   A. $y = \sin(x) + 2$ **B.** $y = \sin(x) - 2$ **C.** $y = \sin(x + 2)$ **D.** $y = \sin(x - 2)$
   E. $y = \sin(x/2)$

3. The domain of the function $f(x) = \sqrt{\dfrac{1}{9 - x^2}} + \sqrt{x - 1}$ is the set of all real numbers x for which
   A. $x < -3$ or $x > 3$ **B.** $x < 3$ **C.** $x \geq 1$ **D.** $1 \leq x < 3$ **E.** $1 < x < 3$

4. $\displaystyle\lim_{x \to -1^-} \frac{|x + 1|}{x + 1} =$
   A. 1 **B.** -1 **C.** 0 **D.** $-\infty$ **E.** Does not exist

5. The function $f(x) = \begin{cases} -x - 1 & \text{if } x < -1 \\ 0 & \text{if } -1 \leq x \leq 1 \\ x & \text{if } x > 1 \end{cases}$ is
   A. continuous everywhere
   B. continuous at 1 but discontinuous at -1
   C. continuous at -1 but discontinuous at 1
   D. continuous at all points except for 1 and -1
   E. discontinuous everywhere

6. Find the equation of the line tangent to the curve $y = x^2 + 4x + 4$ at $(1, 9)$.
   A. $y = 9x$ **B.** $y = 6x - 15$ **C.** $y = 6x + 3$ **D.** $y = 2x + 1$
   E. None of the above

7. If $f(3) = 2$, $f'(3) = 4$, $g(3) = 5$, and $g'(3) = 6$, then the derivative of $\dfrac{f(x)}{g(x)}$ at $x = 3$ is $\left(\dfrac{f}{g}\right)'(3) =$
   A. 0.32 **B.** $2/3$ **C.** $-8/25$ **D.** 0 **E.** Undefined

Regular problems: show all your work

8. Sketch the graphs of:

   (a) $(x-3)^2$

   (b) $3\cos x + 2$

   (c) $-\sin\left(x - \frac{\pi}{2}\right)$

   (d) e^{-x-1}

9. Find a formula for the function whose graph is obtained from the graph of $f(x) = e^x - 1$ by

   (a) Reflecting about the y-axis.

   (b) Vertically compressing by a factor of 5 and then shifting 3 units to the left.

   (c) Reflecting about the x-axis and then shifting 2 units down.

10. Let $f(x) = 2 - x, \quad g(x) = \dfrac{1}{x}, \quad h(x) = \sqrt{x+1}$. Find the following functions and state their domains:

    (a) $g \circ f$

    (b) $f \circ h$

    (c) $g \circ h$

11. Evaluate the limits:

    (a) $\lim\limits_{x \to 5} (7x - 25)$

    (b) $\lim\limits_{x \to -1} \dfrac{x^3 + x^2}{x^2 + 3x + 2}$

    (c) $\lim\limits_{x \to 0} \dfrac{3 - \sqrt{9+x}}{x}$

    (d) $\lim\limits_{x \to 2^+} \dfrac{x^3 - 2}{x^2 - x - 2}$

    (e) $\lim\limits_{x \to 2^-} \dfrac{x^3 - 2}{x^2 - x - 2}$

    (f) $\lim\limits_{x \to 2} \dfrac{x^3 - 2}{x^2 - x - 2}$

    (g) $\lim\limits_{x \to 0} x^4 \cos\left(\dfrac{1}{x}\right)$

12. Find c such that the function $f(x) = \begin{cases} cx & \text{if} \quad x \geq 2 \\ 5 - x & \text{if} \quad x < 2 \end{cases}$ s continuous everywhere.

13. Show that the equation $x^5 - 4x + 2 = 0$ has at least one solution in the interval $(1, 2)$.

14. Find the vertical asymptotes of $f(x) = \dfrac{(x+2)(3x-4)}{(x-5)(x+7)}$.

15. Differentiate the following functions:

(a) $f(x) = 7x - 3$

(b) $p(s) = s^5 - 2s^4 + 3s^3 - 4s^2 + 5s - 6$

(c) $f(t) = \dfrac{3t^2 - 5t + 1}{\sqrt{t}}$

(d) $g(x) = x^2 - \dfrac{x^3}{\sqrt[4]{x}} + \dfrac{3}{x}$

(e) $q(y) = \dfrac{y^2 + y + 1}{y + 1}$