Math 75A   **Maria Nogin**
Practice test 2

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. How many vertical asymptotes does the curve $y = \dfrac{x+1}{x(x+2)(x+3)}$ have?

   A. 0   **B.** 1   **C.** 2   **D.** 3   **E.** 4

2. $\lim\limits_{x \to 2} \dfrac{5}{x-2} =$

   A. 0   **B.** 5   **C.** ∞ **D.** $-\infty$ **E.** Does not exist

3. $\lim\limits_{x \to -\infty} \dfrac{x+2}{3x+4} =$

   A. 1   **B.** $\frac{1}{2}$ **C.** $\frac{1}{3}$ **D.** 0   **E.** Does not exist

4. Find the rate of change of $y = 3x + 5$ at $x = 4$.

   A. 3   **B.** 4   **C.** 5   **D.** 17
   E. None of the above

5. Find the derivative of $\sqrt{2x}$.

   A. $\dfrac{2}{\sqrt{x}}$ **B.** $\dfrac{2}{\sqrt{2x}}$ **C.** $\dfrac{1}{2\sqrt{x}}$ **D.** $\dfrac{1}{\sqrt{2x}}$ **E.** $\dfrac{1}{2\sqrt{2x}}$

6. Simplify the expression: $\dfrac{8x^3\sqrt{x}}{(3x^2)^2 + 7x^4}$

   A. $\dfrac{8\sqrt{x}}{10x^2}$ **B.** $\dfrac{\sqrt{x}}{2}$ **C.** $\dfrac{1}{2\sqrt{x}}$ **D.** $\dfrac{4}{5\sqrt{x}}$ **E.** $4\sqrt{x}$

7. The position of an object at time t is given by $s(t) = 4\sin(t) + 2\cos(t)$. Find the velocity of this object at $t = \dfrac{\pi}{3}$.

   A. $1 + \sqrt{3}$ **B.** $1 + 2\sqrt{3}$ **C.** $1 - 2\sqrt{3}$ **D.** $2 + \sqrt{3}$ **E.** $2 - \sqrt{3}$

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8. 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

Regular problems: show all your work

9. Evaluate the limits:

   (a) $\displaystyle\lim_{x \to 2^+} \frac{x^3 - 2}{x^2 - x - 2}$

   (b) $\displaystyle\lim_{x \to 2^-} \frac{x^3 - 2}{x^2 - x - 2}$

   (c) $\displaystyle\lim_{x \to 2} \frac{x^3 - 2}{x^2 - x - 2}$

   (d) $\displaystyle\lim_{x \to \infty} \frac{5x^3 - x - 3}{4x^3 + 3x^2 - 3}$

   (e) $\displaystyle\lim_{x \to -\infty} \frac{5x^2 - x - 3}{4x^3 + 3x^2 - 3}$

   (f) $\displaystyle\lim_{x \to \infty} \frac{5x^3 - x - 3}{4x^2 + 3x - 3}$

   (g) $\displaystyle\lim_{x \to \infty} \frac{\sqrt{4x^2 + 5}}{3x - 3}$

   (h) $\displaystyle\lim_{x \to -\infty} \frac{\sqrt{4x^2 + 5}}{3x - 3}$

   (i) $\displaystyle\lim_{x \to \infty} (3 - x + 2x^2 - 5x^3)$

   (j) $\displaystyle\lim_{x \to -\infty} (3 - x + 2x^2 - 5x^3)$

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

11. Differentiate the following functions:

    (a) $f(x) = 5$

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

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

    (d) $f(t) = \sqrt{t}$

    (e) $f(x) = \dfrac{2}{x}$

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

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

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

(i) $y = 3\sin(x^5) + \dfrac{\pi}{2}$

(j) $f(x) = \cos(4)(x^3 - 3x)$

(k) $g(x) = \dfrac{x^3 - 5}{\cos(-x)}$

(l) $h(x) = \tan(x)\left(\dfrac{1}{\sqrt[4]{x^3}} + \dfrac{2}{x}\right)$

12. Find the points where the tangent line to the graph of $f(x) = x^5 - 80x$ is horizontal.

13. Find an equation of the tangent line to $y = \sqrt{2x + 3}$ at $(3, 3)$.