MA 2310: Test 1.1

No Calculators, no cell phones, no electronic devices of any kind allowed. Justify all answers with correct work.

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1. Compute the following:

   (a) $\cos(2\pi/3)$

   (b) $\sin(5\pi/4)$

   (c) $\cot(7\pi/6)$

   (d) $\tan(\sin^{-1}(\frac{x}{x+1})$

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2. Compute the limit.

(a) $\lim_{x \to 3} \dfrac{3x^2 - 27}{x - 3}$

(b) $\lim_{x \to 1} \dfrac{\sqrt{x} - 1}{x - 1}$

(c) $\lim_{x \to 0} \dfrac{\sin(3x^2)}{x^2}$

(d) $\lim_{n\to\infty} \dfrac{6n^3+5n+2}{5n+2}$

(e) $\lim_{n\to\infty} \dfrac{7n^5+5n+2}{2n^5+2}$

(f) $\lim_{n\to\infty} \dfrac{4n^4+5n+2}{3n^6+2}$

3. Write down the definition of the derivative. Compute the derivative of $f(x) = x^3$ using the definition.

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4. Let $f(x) = 2\sin(x)$. Find the equation of the tangent line at $x = \pi/4$ (if it helps $\pi/4 \approx 0.8$ and $\sqrt{2} \approx 1.4$). Graph the function $f(x)$ and the tangent line you found.

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5. Compute the derivatives of the following functions.

(a) $f(x) = x \csc(x)$

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

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

(d) $f(x) = \sec(x^2)\cos(x^2)$

(e) $f(x) = \sin^{-1}(3x + 1)$

(f) $f(x) = \ln(\csc(2x + 1))$

6. Compute the derivative implicitly.

$$e^{xy} - x^2 + y^2 = 11$$

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7. Use implicit differentiation to show

$$\frac{d}{dx}[\sin^{-1}(x)] = \frac{1}{\sqrt{1-x^2}}$$
