

Math 134 Background Quiz

The purpose of this quiz is to help you see if you are ready for Math 134. It has pre-calculus and calculus material and some logic questions. Do not use a graphing calculator or an app for computations. Closed notes.

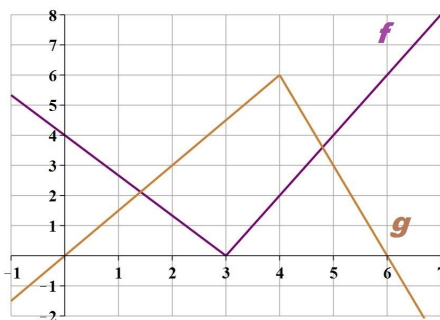
1. Find the sum of solutions to the equation

$$\sqrt{x+1} + \frac{1}{\sqrt{x+1}} = \frac{13}{6}.$$

2. Jerry runs at a steady rate and Tom runs m times as fast where $m > 1$. If Tom gives Jerry a head start of h meters, how many meters must Tom run to overtake Jerry?
3. Evaluate the following derivatives.

(a) $\frac{d}{dx}(5x^2 + 4x)^7$ (b) $\frac{d}{dx}xe^{x^2}$ (c) $\frac{d}{dx}(\ln(x^2 + 1) - \tan(5x))$

4. Let $h(x) = f(g(x))$. Use the picture below to compute $h'(1)$.



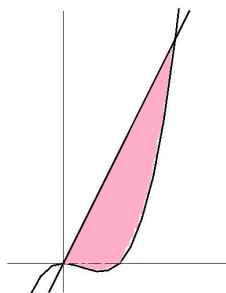
5. Find the equation of the tangent line to the function $f(x) = 2x^3 - 4x + 7$ at the point where $x = -1$.
6. Evaluate the following integrals.

(a) $\int 3x^3 - 4x^2 + 6x - 11 \, dx.$

(b) $\int_0^{\pi/4} \cos(3x) \, dx.$

(c) $\int x \sin(x^2) \, dx.$

7. Find the shaded area below. The line has equation $y = 2x$ and the curve has equation $y = x^3 - x^2$.



8. State the Fundamental Theorem of Calculus. There are two versions of the theorem. If you know both, state both of them. Otherwise, state whichever one you know.

9. Here is a "proof" of $2 = 3$. Find the line whose deduction from the previous is flawed.

1. Assume $x = 2$.
2. Then, $2x = x + 2$.
3. So $-x^2 + 2x = -x^2 + x + 2$.
4. Then we factor to get $-x(x - 2) = -(x + 1)(x - 2)$.
5. Simplifying we have $x = x + 1$.
6. Since $x = 2$, $x = x + 1 = 3$.

10. Is the following limit computation correct? If not, which step has the error?

1. $\lim_{x \rightarrow -\infty} \frac{x}{\sqrt{x^2 + 1}}$
2. $= \lim_{x \rightarrow -\infty} \frac{\frac{x}{x}}{\frac{\sqrt{x^2 + 1}}{x}}$.
3. $= \lim_{x \rightarrow -\infty} \frac{1}{\frac{\sqrt{x^2 + 1}}{x}}$.
4. $= \lim_{x \rightarrow -\infty} \frac{1}{\frac{\sqrt{x^2 + 1}}{\sqrt{x^2}}}$.
5. $= \lim_{x \rightarrow -\infty} \frac{1}{\sqrt{\frac{x^2 + 1}{x^2}}}$.
6. $= \lim_{x \rightarrow -\infty} \frac{1}{\sqrt{1 + \frac{1}{x^2}}}$
7. $= \frac{1}{\sqrt{1 + 0}} = 1$

11. Which of the following statements are correct?

- (a) For any two real numbers a and b we have $\frac{a^2 + b^2}{2} \geq ab$.
- (b) For any two real numbers a and b we have $|a + b| \leq |a| + |b|$.
- (c) For any two non-negative numbers a and b we have $\sqrt{ab} \leq \frac{a + b}{2}$.
- (d) For any positive real number a we have $a + \frac{1}{a} \geq 2$.