

Math 142 – Exam 1
Show All Work
Make all reasonable simplifications

1. (a). Let $f(x) = \ln(x^3 + 1) + 5^{2x}$, then $f'(x) =$ _____

(b). Let $f(x) = \sqrt{e^{2x} + 3}$, then $f''(x) =$ _____

2. (a). Solve: $\log_2(x + 11) - \log_2(x - 3) = 3$, $x =$ _____ (Answer should be a number)

(b). The domain of $\sin^{-1}(\ln x)$ is _____ **Hint:** The answer is a closed interval.

3. $\int_1^{\sqrt{e}} \frac{1}{x\sqrt{1 + [\ln x]^2}} dx =$ _____

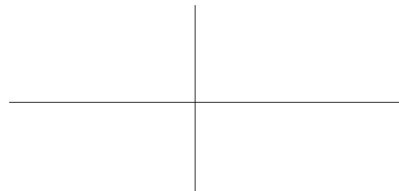
4. (a). Where is $f(x) = x^2 \ln x$ concave upward? Answer: _____

Hint: Recall that $f(x)$ is concave upward when $f''(x) > 0$.

- (b). $\tan(2 \tan^{-1} x) =$ _____ (Simplify to a *rational function*.)

and use your answer to find the value of $\tan(2 \tan^{-1}(\frac{1}{2})) =$ _____ (a fraction)

5. Sketch the graph of $y = \tan^{-1} x$. Clearly denote all intercepts, domain, range, and any asymptotes. Domain: _____ Range: _____

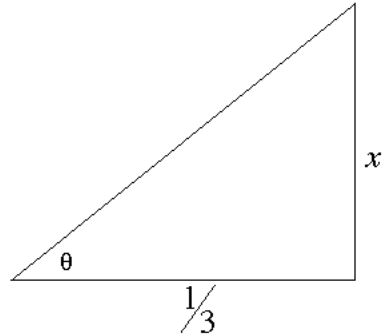


6. Let $y = (3x + 1)^{x^2}$, then $\frac{dy}{dx} =$ _____ (only x 's in your answer – no y 's).

7. For the triangle below, the side labeled x is changing at a rate of 40 inches/minute.

(a). Express θ as a function of x . $\theta =$ _____

(b). At what rate is θ changing when $x = 1$? Answer: _____ (show your work.)



8. (a). Evaluate: $\int \tan^3 x \sec^3 x dx =$ _____

(b). Evaluate: $\int \cos^5 x dx =$ _____

9. (a). $\int \frac{x^2}{\sqrt{1+4x^6}} dx =$ _____

(b). $\int \frac{\sin^2 x}{\cos x} dx =$ _____

10. Evaluate: $\int \frac{x+8}{x^2+10x+26} dx =$ _____