QUIZ # 5

Name (1 point): ....

Problem: Compute the ones from the following integrals that can be computed (and point out which one cannot):

(a) $\int (x^4 + 3x^2 + 1)(4x^3 + 6x)\, dx$ (3 points)

(b) $\int \frac{1}{x^2+1} \cdot 2x\, dx$ (3 points)

(c) $\int e^{x^2}\, dx$ (3 points)

Proof. (a) set $u = x^4 + 3x^2 + 1 \Rightarrow du = (4x^3 + 6x)\, dx$ so then the integral becomes:
$$\int u\, du = \frac{u^2}{2} + C = \frac{(x^4 + 3x^2 + 1)^2}{2} + C$$

(b) set $u = x^2 + 1 \Rightarrow du = 2x\, dx$ so then the integral becomes:
$$\int \frac{1}{u}\, du = \ln |u| + C = \ln |x^2 + 1| + C$$

(c) try $u = x^2$ ... doesn't work!; try $u = e^{x^2}$ ... doesn't work either! since there's no "helper", no second component to help us produce the du ... so we can safely say here that this function's integral cannot be computed (actually, as I mentioned in class, it has been proven for this function that one cannot write down its antiderivative - that is, it exists, but no expression involving polynomials, natural logs or exponential, can be produced to express it).   □