```
decidable_iff_exists_bool_function_2  THM

⊢  ∀P:(T→Z→Prop).
|  (∀x:T, y:Z. Dec(P(x,y)))
|  ⇒
|  (∃f_p:(T→Z→𝔹). ∀x:T, y:Z. P(x,y) ⟺ f_p(x,y))  by UnivCD
|
1. T : Type
2. Z : Type
3. P : T→Z→Prop
4. ∀x:T, y:Z. Dec(P(x,y))
⊢  ∃f_p:(T→Z→𝔹). ∀x:T, y:Z. P(x,y) ⟺ f_p(x,y)
| by Repeat (Unfolds [‘decidable‘;‘or‘;‘not‘;‘all‘] 4)
|    THEN
|    RenameVar ‘g’ 4
|
4. x:T→y:Z→P(x,y)+(P(x,y) ⇒ False)
⊢  ∃f_p:(T→Z→𝔹). ∀x:T, y:Z. P(x,y) ⟺ f_p(x,y)
| by Witness λx,y. InjCase(g(x,y) ; true₂; false₂) THEN Analyze 0
|    THEN
|    Reduce 0
|
5. x : T
⊢  ∀y:Z. P(x,y) ⟺ InjCase(g(x,y) ; true₂; false₂)  by Analyze 0
|
6. y : Z
⊢  P(x,y) ⟺ InjCase(g(x,y) ; true₂; false₂)  by Witness4 x
|
7. y1 : y:Z→P(x,y)+(P(x,y) ⇒ False)
8. y1 = g(x)
⊢  P(x,y) ⟺ InjCase(g(x,y) ; true₂; false₂)  by With y (Analyze -2)
|
9. y2 : P(x,y)+(P(x,y) ⇒ False)
10. y2 = y1(y)
⊢  P(x,y) ⟺ InjCase(g(x,y) ; true₂; false₂)
| by HypSubst 8 10 THEN RevHypSubst 10 0
|
10. y2 = g(x,y)
⊢  P(x,y) ⟺ InjCase(y2 ; true₂; false₂)  by Analyze -2 THEN Reduce 0
|
9. y3 : P(x,y) ⇒ False
10. inr(y3) = g(x,y)
11. P(x,y)
⊢  False  by Analyze 9
END
```