```
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% 1). a).
syms x y;
f = sqrt(2*x^2 + 3*y^3 - 5);
fx = diff(f, x);
fy = diff(f, y);
fx_at_3_2 = subs(fx, {x, y}, {3, 2});
fy_at_3_2 = subs(fy, {x, y}, {3, 2});

fprintf('fx at (3, 2): %s\n', char(fx_at_3_2));
```

```
fx at (3, 2): (6*37^(1/2))/37
```

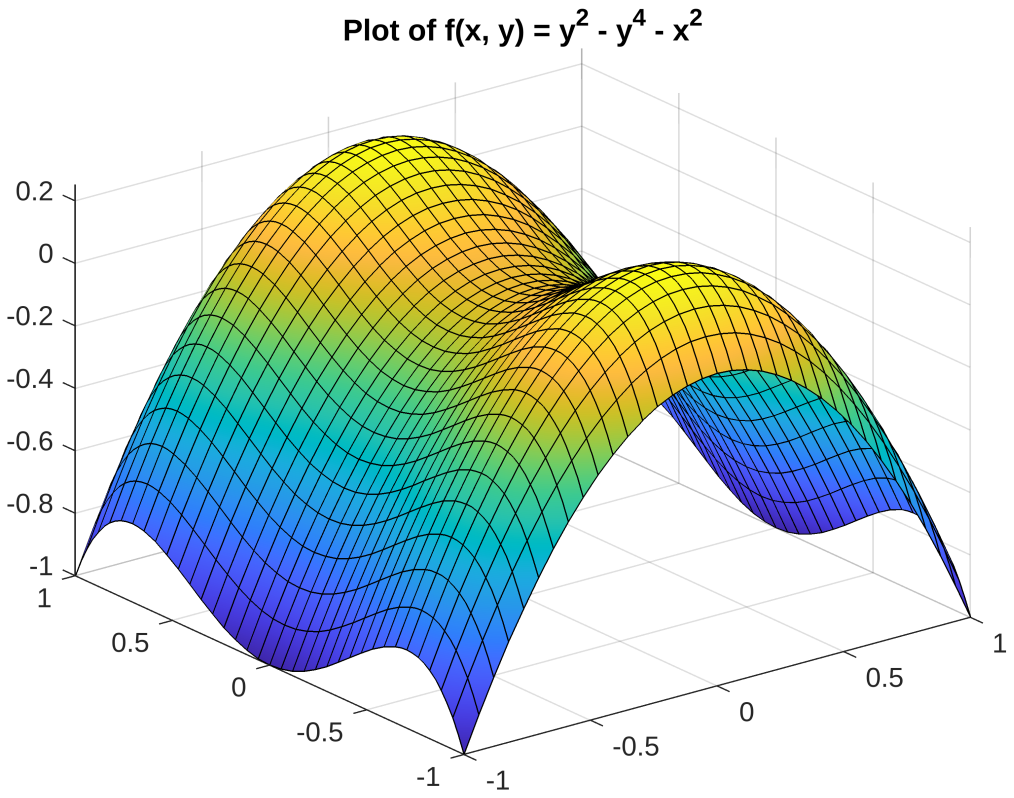
```
fprintf('fy at (3, 2): %s\n', char(fy_at_3_2));
```

```
fy at (3, 2): (18*37^(1/2))/37
```

```
% 1). b).
syms x y z;
f = -x*y*exp(-x^2 - y^2 + z);
fxy = diff(diff(f, x), y);
fyx = diff(diff(f, y), x);
difference = simplify(fxy - fyx);

fprintf('fxy - fyx simplified: %s\n', char(difference));
```

```
fxy - fyx simplified: 0
```

```
% 1). c).
%The easiest one to find would be fxyz because the function -xye-x2-2y2+z
is factorable. The factor -xy is independent of z and can be treated
as a constant when differentiating with respect to z. This significantly
simplifies the calculation.

%The hardest would likely be fzyx. This is because when you first
differentiate with respect to z, the entire function is affected (including
the terms -x2 and -y2 in the exponent). This means that further derivatives
with respect to y and x would be more complex to calculate.

% 2). a).
f = @(x,y) y.^2 - y.^4 - x.^2;
fsurf(f,[-1 1])
title('Plot of f(x, y) = y^2 - y^4 - x^2');
```




```
% 2). b).
syms x y;
f = y^2 - y^4 - x^2;
grad_f = gradient(f, [x, y]);
sols = solve(grad_f == [0, 0], [x, y]);

fprintf('Solutions to grad_f = [0, 0]:\n');
```

```
Solutions to grad_f = [0, 0]:
```

```
disp(sols);
```

```
    x: [3×1 sym]
    y: [3×1 sym]
```

```
% 2). c).
H = hessian(f, [x, y]);
discriminants = double(subs(det(H), {x, y}, {sols.x, sols.y}));

fprintf('Discriminants of Hessian matrix:\n');
```

```
Discriminants of Hessian matrix:
```

```
disp(discriminants);
```

```
    -4
     8
     8
```

```
% 2). d).
fxx = diff(f, x, 2);
fxx_values = double(subs(fxx, {x, y}, {sols.x, sols.y}));

fprintf('fxx values at solutions:\n');
```

```
fxx values at solutions:
```

```
disp(fxx_values);
```

```
    -2
    -2
    -2
```

you need to say which one is Saddle point which one is local maximum

– 4pt