

Kevin White

9/29/2021

208 9:00AM 9/20/2021

Yeying Chen 9:00AM 10/4/2021

Question 1

Row 1

```
syms x a b
g(x) = a*x+b;
f(x) = g(x)^2;
f(x);
diff(f(x),x)
```

$$\text{ans} = 2a(b + ax)$$

```
k = simplify(diff(f(x),x)/(2*g(x)))
```

$$k = a$$

Row 2

```
syms x a b c
g(x) = a*x^2+b*x+c;
f(x) = g(x)^2;
f(x);
diff(f(x),x)
```

$$\text{ans} = 2(b + 2ax)(ax^2 + bx + c)$$

```
k = simplify(diff(f(x),x)/(2*g(x)))
```

$$k = b + 2ax$$

Row 3

```
syms x a b c d
g(x) = a*x^3+b*x^2+c*x+d;
f(x) = g(x)^2;
f(x);
diff(f(x),x)
```

$$\text{ans} = 2(3ax^2 + 2bx + c)(ax^3 + bx^2 + cx + d)$$

```
k = simplify(diff(f(x),x)/(2*g(x)))
```

$$k = 3ax^2 + 2bx + c$$

Explanation:

$g(x)$ is used for the $f(x)$ functions. $k(x)$ is the derivative of $g(x)$

Question 2

Row 1

```
syms x
g(x) = x^2-3*x;
n = 2;
f(x) = g(x)^n
```

$$f(x) = (3x - x^2)^2$$

```
[subs(n*(g(-1)^(n-1)),-1)
subs(diff(g(x),x),x,-1)
subs(diff(f(x),x),x,-1)]'
```

$$\text{ans} = (8 \quad -5 \quad -40)$$

Row 2

```
syms x
g(x) = x^2-3*x;
n = 3;
f(x) = g(x)^n
```

$$f(x) = -(3x - x^2)^3$$

```
[subs(n*(g(-1)^(n-1)),-1)
subs(diff(g(x),x),x,-1)
subs(diff(f(x),x),x,-1)]'
```

$$\text{ans} = (48 \quad -5 \quad -240)$$

Row 3

```
syms x
g(x) = x^2-3*x;
n = -1;
f(x) = g(x)^n
```

$$f(x) =$$

$$-\frac{1}{3x - x^2}$$

```
[subs(n*(g(-1)^(n-1)),-1)
subs(diff(g(x),x),x,-1)
subs(diff(f(x),x),x,-1)]'
```

$$\text{ans} =$$

$$\left(-\frac{1}{16} \quad -5 \quad \frac{5}{16}\right)$$

Row 4

```
syms x
g(x) = x^2-3*x;
n = 1/2;
f(x) = g(x)^n
```

$$f(x) = \sqrt{x^2 - 3x}$$

```
[subs(n*(g(-1)^(n-1)),-1)
subs(diff(g(x),x),x,-1)
subs(diff(f(x),x),x,-1)]'
```

ans =

$$\left(\frac{1}{4} \quad -5 \quad -\frac{5}{4}\right)$$

Explanation:

g(x) remains consistent but for f(x) it is always g(x) to the power of n to give different results

Question 3

Row 1

```
syms x
g(x) = 2*x;
f(x) = sin(g(x));
round([vpa(cos(g(3.0)))
vpa(subs(diff(f(x),x),x, 3.0))
vpa(subs(diff(g(x),x),x, 3.0))]',4)
```

ans = (0.9602 1.9203 2.0)

Row 2

```
syms x
g(x) = x/2+3;
f(x) = sin(g(x));
round([vpa(cos(g(3.0)))
vpa(subs(diff(f(x),x),x, 3.0))
vpa(subs(diff(g(x),x),x, 3.0))]',4)
```

ans = (-0.2108 -0.1054 0.5)

Row 3

```
syms x
g(x) = x^2;
f(x) = sin(g(x));
round([vpa(cos(g(3.0)))
vpa(subs(diff(f(x),x),x, 3.0))
```

```
vpa(subs(diff(g(x),x),x, 3.0))]',4)
```

```
ans = (-0.9111 -5.4668 6.0)
```

Row 4

```
syms x
g(x) = exp(x);
f(x) = sin(g(x));
round([vpa(cos(g(3.0)))
vpa(subs(diff(f(x),x),x, 3.0))
vpa(subs(diff(g(x),x),x, 3.0))]',4)
```

```
ans = (0.3286 6.6 20.0855)
```

Explanation:

$g(x)$ is the input for the sin in the function $f(x)$. This means the derivative of $f(x)$ is the cos of $g(x)$