Question 1:

(a)[5 points] Compute and simplify the difference quotient for the function $f(x) = \dfrac{x}{4} - \dfrac{x^2}{5}$. Recall, a difference quotient is the expression $\dfrac{f(x+h) - f(x)}{h}$.

(b)[5 points] Simplify

$$\frac{\dfrac{2}{(x+h)^2} - \dfrac{2}{x^2}}{h}$$

Question 2:

(a)[5 points] Find the centre and radius of the following circle:

$$4x^2 + 8\pi x + 4y^2 - 12y + 4\pi^2 + 8 = 0 .$$

(b)[5 points] Let $f(x) = 2e^{2x} - 2e^x - 1$. Complete the square to express $f(x)$ in the form
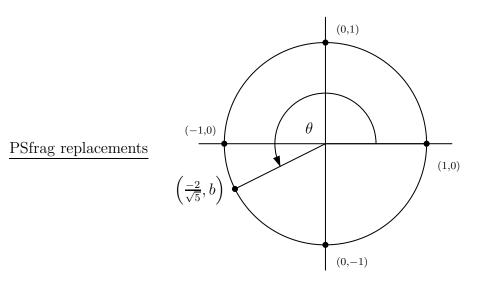
$$f(x) = a(e^x + b)^2 + c$$

for some numbers a, b and c.

Question 3: [**10 points**]

(a)[**3 points**] Convert $4°$ to radians.

(b)[**3 points**] Convert $\pi/27$ radians to degrees.

(c)[**4 points**] Referring to the unit circle below, find the exact numerical value of $\sin\theta$.

PSfrag replacements

(0,1)

(−1,0)

θ

(1,0)

$\left(\frac{-2}{\sqrt{5}}, b\right)$

(0,−1)

Question 4:

(a)[2 points] Find

$$\sin\left(\frac{-11\pi}{2}\right)$$

(b)[3 points] Find

$$\sqrt[3]{\cos\left(1071\pi\right)}$$

(c)[2 points] Find

$$\sin\left(1{,}000{,}000{,}007\pi\right)$$

(d)[3 points] Find

$$\cos\left(931\pi + \frac{3\pi}{2}\right)$$

Question 5:

(a)[2 points] Find
$$\cos\left(\frac{29\pi}{6}\right)$$

(b)[2 points] Find
$$\sin\left(\frac{-11\pi}{4}\right)$$

(c)[3 points] Find
$$\cos\left(\frac{-12{,}002\pi}{3}\right)$$

(d)[3 points] Given that $\sin\left(k\pi/3\right) < 0$, where k is a positive integer such that $k < 5$, what is $\cos\left(k\pi/3\right)$?