

1. (4 pts) Fill in the exact values:

$$\ln(\sqrt{e})$$

$$\arctan(1) =$$

$$(0.01)^{-1/2} =$$

$$\sin\left(\frac{7\pi}{6}\right) =$$

2. (6 pts) Circle the correct answer (assume that  $x \neq 0$ ):

(a) The expression  $\frac{3x^2}{x^4 + 9x^2}$  is equivalent with:

(i)  $\frac{1}{x^2 + 3}$       (ii)  $\frac{3}{x^2} + \frac{1}{3}$       (iii)  $\frac{1}{x^4 + 3}$       (iv)  $\frac{3}{x^2 + 9}$       (v)  $\frac{2}{3x^2}$

(b) The expression  $\frac{x^2}{\sqrt[3]{x^2}}$  is equivalent with:

(i)  $\sqrt{x}$       (ii) 1      (iii)  $x\sqrt[3]{x}$       (iv)  $x^{-1/3}$       (v) none of the above

(c)  $\lim_{x \rightarrow +\infty} \frac{x^2 + 2}{3x^2 + 4} =$       (i) 1      (ii) 3/7      (iii) 1/3      (iv) 1/2      (v) other

3. (10 pts) Compute the following limits

(a)  $\lim_{x \rightarrow 0} \frac{x^2}{1 - \cos(3x)}$

(b)  $\lim_{x \rightarrow +\infty} \left(1 + \frac{1}{x}\right)^x$

4. (5 pts) Compute  $\frac{d}{dx}(\tan^{-1}(e^{3x}))$ . Recall that  $\tan^{-1}$ , also denoted  $\arctan$ , is the inverse function of  $\tan$ .

5. (5 pts) Compute  $g''(x)$  if  $g(x) = \sin(x^2)$ .

6. (20 pts) Compute the following anti-derivatives (5 pts each)

(a)  $\int (2x^3 + \sec^2 x - \frac{1}{3x^2}) dx$

(b)  $\int x^2 \sqrt{x^3 + 9} dx$

(c)  $\int \frac{1}{\sqrt{4-x^2}} dx$

(d)  $\int \frac{1}{x \ln x} dx$